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JOHN F. BOOTH
Former Director of the Economic Branch, Canada Department of Agriculture
Vice-President of AFEA, 1933
President, Canadian Agricultural Economics Society, 1938-39
Major Fields: General Agricultural Economics and Farm Management

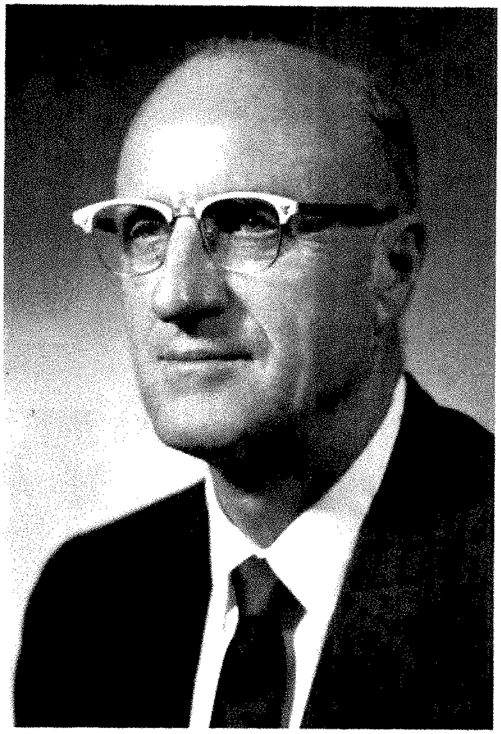
JOHN F. BOOTH pioneered in the development and application of agricultural economics in Canada and played a significant rôle in advancing the profession throughout the country. He organized the Agricultural Economics Division for the Canada Department of Agriculture in 1929 and served as director of the Division until 1960, when he retired to become a special advisor and consultant. He gathered and trained a competent staff, many of whom in turn were later called upon to build economic research groups in other federal and provincial agencies and universities. Much of the rapid expansion of the economist's role in farm management, marketing, and agricultural policy in Canada can be traced to his pioneering efforts.

John Booth was sensitive to the problems of the times. He aided in the development of national marketing institutions and the planning of legislation to meet drought conditions in the prairies. Under his leadership outlook work in Canada was started and refined to meet the needs of both farmers and government. He took an active role in the formulation of the rural adjustment program in Canada in the late 1950's.

Born in Chicago, Illinois, in 1895, John Booth moved at an early age to Canada, where his family settled on a farm in central Saskatchewan. He received his B.S.A. degree in 1919 from the University of Saskatchewan and his M.S. degree in 1924 and his Ph.D. degree in 1926 from Cornell University. He was an agricultural representative and later director of marketing for the Saskatchewan Department of Agriculture between 1919 and 1922. He was an instructor in marketing at Cornell University from 1923 to 1926. He served as a senior economist with the Bureau of Agricultural Economics in Washington from 1926 to 1929.

Dr. Booth is known for his patience and skill in working with others, his practical application of economic analysis, and the encouragement given to younger men in the profession to develop their ideas and broaden their experience.

He has filled many posts and undertaken each with enthusiasm and energy. He was vice-president of the AFEA in 1933 and president of the Canadian Agricultural Economics Society in 1938-39. Abroad, he was a member of the economic mission to Malaya of the International Bank for Reconstruction and Development and was a charter member of the FAO Hot Springs Conference. He also was a Canadian representative at the first FAO meeting at Quebec.



MAURICE M. KELSO
Dean of Agriculture and Director of the Agricultural Experiment Station,
Montana State University, 1953–1957
Vice-President of AFEA, 1947-48 and 1951–1953
President of Western Farm Economics Association, 1952-53
Major Fields: Land and Water Economics, Conservation and Development

MAURICE M. KELSO was born in South Dakota in 1905. He received his B.S. (with distinction) from the University of Minnesota in 1927; his M.S. from Connecticut State College (now the University of Connecticut) in 1931; and his Ph.D. from the University of Wisconsin in 1933.

He began his broad, varied, and productive career by serving as chief of the Planning Section, Subsistence Homesteads Division, U. S. Department of the Interior, 1933-34. He worked for the Land Utilization Division, Resettlement Administration, from 1934 to 1938. He became chief of the Division of Land Economics, Bureau of Agricultural Economics, USDA, in 1938, and in 1942 went to Albuquerque, New Mexico, as regional representative of the Bureau of Agricultural Economics, Southwest Region. He was manager of Mackay and Mackay Ranch in Montana during most of the war years (1942–1946).

Then followed an outstanding academic career at Montana State College. He was professor of agricultural economics, 1946–1948; head of the Department of Agricultural Economics and Rural Sociology, 1948–1953; and dean of agriculture and director of the Agricultural Experiment Station, 1953–1957. Since September 1958 he has been with the University of Arizona. While on sabbatical leave in 1965 he was a Fulbright lecturer in natural resource economics at the University of New England and the University of Sydney in Australia.

He was vice-president of the American Farm Economic Association in 1951–1953; vice-president (1947-48) and president (1952-53) of the Western Farm Economics Association; and a member of the Editorial Council, *Journal of Farm Economics*, in 1950-51 and 1962-1965.

Maurice Kelso has made path-breaking contributions to the literature, but he is more than a successful technician and more than an eminent economist-professional. His guidance and counsel have been sought by students and colleagues. His ability to wrestle with pragmatic problems in the classroom and his insistence on applying the Socratic method to questions that arise in the course of professional life are well known. These and other attributes, such as his drive to perfect knowledge in his beloved land economics, constitute the reason he could, in 1958, strike out in new directions in resource use and the economics of water management.

His leadership and fortitude in confronting fiction and fancy with fact reaffirms our faith in science. His consistent emphasizing of virtues and playing down of the smallness and the unconfirmed about Man reaffirms our humanistic trust.

ELMER JOSEPH WORKING
Former Chairman of the Department of Agricultural Economics, Washington State University, Retired 1965
Major Field: Agricultural Prices

ELMER JOSEPH WORKING. It is a rare graduate student in agricultural economics, economics, or statistics who has not had as a reading assignment the classic statement, "What Do Statistical Demand 'Curves' Show?" (*Quart. J. Econ.* 41:212–235, Feb. 1927). Written during the course of Joe Working's own graduate work, this original presentation of the "identification" problem in demand analysis remains a model of penetrating insight, precision of thought, and clarity of presentation.

Born in Colorado in 1900 and reared in the West, Joe Working graduated from the University of Arizona in 1921 and pursued his graduate education at the University of Minnesota, Iowa State, Brookings Graduate School, and Harvard. Much of his career was in the USDA and at the University of Illinois. In addition he taught at Iowa State University, the University of Minnesota, the USDA Graduate School, and American University, and also was visiting professor at the University of Chicago. He returned to the West in 1954 and served as chairman of the Department of Agricultural Economics at Washington State University until retirement in 1965.

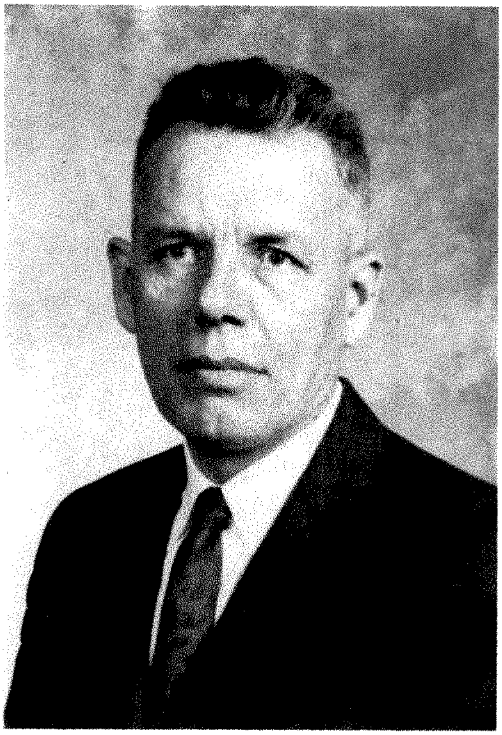
His classic study was followed by further scholarly articles which helped chart the course of demand and price analysis. His penetrating insight also opened up new paths for further development of statistical and econometric techniques as well as further analysis and measurement of long-run demand. During and after Wrold War II, he critically examined the problem of price control in a number of publications. In still other articles he explored the construction and use of index numbers.

His "Appraising the Demand for American Agricultural Output During Rearmament" won the AFEA Best Journal Article award in 1953. In that article, he demonstrated his ability in precision of definition, of conceptualization, and of measurement.

It is this precision that came through in his discussions with individual students. He listened and asked questions until he grasped the nature of the problem, and then he asked further questions until the student saw, not the solution, but the paths of further exploration for reaching the solution.

His professional achievements are expressions of his basic drive to explore—whether new roads, unfamiliar mountains, or isolated communities. He has a deep concern for fairness and honesty, an impatience with the insincere, and a humanitarian interest in those about him. Although he would be the first to insist on being last, his accomplishments place E. J. Working among the leading scholars in our profession.

(Professor Working died in Denver, Colorado, on October 2, 1968.)



HAROLD F. BREIMYER, a native of Ohio, was educated at Ohio State University, the University of California, and American University. He joined the Agricultural Adjustment Administration in 1936 and has since been variously engaged in economic analysis for agricultural programs, in commodity price analysis and outlook, and in teaching. From 1949 to 1959 he was in charge of outlook work for livestock with the Bureau of Agricultural Economics and Agricultural Marketing Service. In 1959–1961 he was economist for the Council of Economic Advisers, and in 1961–1966, staff economist to the administrator of the Agricultural Marketing Service and Consumer and Marketing Service. His teaching has been at the USDA Graduate School, Montgomery Junior College, the University of Illinois (visiting), and, since 1966, the University of Missouri.

PRESIDENTIAL ADDRESS

The AAEA and USDA in an Associationistic Age

HAROLD F. BREIMYER

THIS paper, breaking with traditional presidential addresses, is contemporary and utilitarian in scope and thrust. It relates, as the title indicates, to the nature and role of our professional Association and of another organization close to our area of concern, the United States Department of Agriculture.

Remarks that follow on the AAEA were stirred by a nagging uncertainty as to whether our way of conducting Association business provides enough communication between members and officers. The chance timing by which significant changes in organization of our body are inaugurated coincident with my administration, and persistent raising of certain thorny issues as to the proper philosophy and format for Association activity, gave further cause for writing and delivering the first half of the paper.

But the topic is dual; it includes not just our professional organization but a much larger, more complex, and more controversial one, the USDA. This ambitious attempt to combine them requires a conceptual backdrop, and it introduces the one global abstraction of the paper. It turns on the meaning of the unifying term *associationism.*

Agricultural economics is an empirically based science. It must ever understand its universe. There is reason to believe that we are currently losing touch with that universe. To use a mod word, we stand in danger of alienation.

At the University of Missouri, graduate students seeking a Ph.D. degree are to be schooled in three areas, quantitative method, macroeconomics, and microeconomics. The first two have built-in appeal but microeconomics must be the anchor area. It is in microeconomics that we are in danger of losing touch with reality.

Our concepts of the basic decision-making unit and the decision-making process are not far different from those of the classicists. We continue to regard those units as independent single-purpose firms that float detached in space as craft manned by marketers and powered by price. We grant that the firms that dominate are now huge and conglomerate, but we persist in supposing that they are of the nature of small firms grown large and still trading by haggling over pennies. In this image, govern-

---

HAROLD F. BREIMYER *is professor of agricultural economics at the University of Missouri.*

ment is a meddling interventionist, sometimes helpful and frequently not.

When challenged, we deny all this, but our ingrained practices disavow the denial.

The structure of the economy is of a kind that departs far from conventional models. Its attributes are strange to us and largely unfathomed. Our mental picture ought to stress, not the independence of economic units, but their interconnection. Linkages abound. They are formal and informal, loose and tight, ad hoc and lasting, tacit and exposed. The lines of connection are horizontal, vertical, and crisscross. They range from unions of migratory workers to interlocking corporate directorates, from loose professional entities such as ours to tightly knit craft and occupational confederations. Private and governmental trade practice rules interlace. One consequence is the bending of axes of mutuality of interest into curlicues.

In other words, the topology to which we must give increasing attention is neither economy-wide-macro nor the micro of the firm. It lies somewhere in between. It is vague, amorphous. The four competitive models fit less and less well. Kenneth Galbraith senses and grapples with these matters in *The New Industrial State* [7]. Probably Ray Goldberg's imaginative coinage of corporate–cooperative structure fits in this framework [8]. The present obsession with bargaining in agriculture makes more sense in such a context than worrying about whether NFO farmers are silly to hold hogs off the St. Paul market.

Restating, our economy is moving toward a structure unlike any we have known. Granted, the trend is not of recent origin; and relevant thereto are the words of a Virginian, Francis Pickens, spoken a century and a half ago. Pickens noted that the "tendency in the modern organization of society, is . . . toward aggregation, under which whole classes and interests are brought to act together, with vigor and unity of single individuals, and the great contest is between classes" [9, p. 403].

It is hard to find a name for the kind of economy that seems to be appearing. It smacks of the old guilds. The title to this paper uses the tongue-twisting word, "associationistic." A better choice might be "syndicalistic."

In treating of the nature and significance of the emerging structure, we may have to borrow from other disciplines. The sociologists have been more alert than we, and economists may have to learn the language of Talcott Parsons and his "new pluralism." We may want to let Jim Shaffer and Al Schmid coach us on the implosive forces of role and what institutional integration means. Political science will become more relevant.[1]

---

[1] A good recent statement of principles, with selected readings, is that of Wells [11]. The publication in which his article appears contains several other relevant articles.

And legally trained economists may come to be the most advantageously differentiated arm of our profession.

Our AAEA

The American Agricultural Economics Association is among the least prepossessing of all organizations. And yet, within our quiet domain, there are evidences of trends that are not inconsistent with the general propositions just set forth. We are a unitary body but not a homogeneous one. That we have several subgroups and that some are always in danger of becoming unstuck is common knowledge. In that regard, changes in our internal government which broaden representation on the executive board, made this year, take on significance.

Until now, the effective leadership of the Association could properly be called that of presidential succession. The executive committee of seven has been composed of two ex-presidents, the president, and the president-elect, plus the secretary–treasurer, who was a presidential appointee. The two vice-presidents were not only outnumbered but short-termers. On the new executive board are only three persons who carry a presidential tag—past, present, and future. There are six directors. Moreover, each director is elected for a three-year term, providing a continuity in office that has not existed previously. The hard-working secretary–treasurer will hold a nonvoting seat on the board, as will the presidents of associated bodies, currently the Western and Canadian associations, and the *Journal* editor.

For the second change, the vernacular language is one-man, one-vote. Throughout the history of our association, its officers have essentially been selected from a single stratum of membership, the teaching and research staffs of universities plus USDA economists of the Bureau of Agricultural Economics stripe and, recently, a few individuals from nonprofit foundations. To my knowledge, every one of the 58 presidents during our Association's history has been so affiliated. Not a soul has been from Extension, not a one from industry, not a one from program agencies of state or federal government. Furthermore, of the 44 vice-presidents holding office since the close of World War II, only 2 were not from the same select group. (The exceptions are Carroll Bottum and True Morse.) And except for two from North Carolina, all of the 44 were from the North or the Pacific Coast.[2]

The new constitution requires that each directorship be filled individually rather than by skimming the highest vote tallies from nominees for multiple offices, and that nominating committees shall "take cognizance of the need for geographical, functional and organizational representation" [2, Art. VII]. The result is the broader range of officers elected this year.

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[2] There has been another selectivity—by the alphabet. In the last ten elections through 1967, the candidate for president whose name was earlier in the alphabet was the voters' choice eight times. Of the 20 vice-presidents elected, 13 were from the 2 lowest in the alphabet among each year's 4 nominees.

It is highly likely that the leadership of our Association henceforth will conform more closely to the spectrum of membership. In my opinion the change was overdue, and its enactment is much to the credit of the Witt administration and the committee headed by Elmer Learn.

Our Role and Goal

The new constitution retained language of long standing as to our corporate object: "The object . . . is to further the development of systematic knowledge of agricultural economics." Moreover, "As a professional organization, the Association shall pursue this object by facilitating scientific research, instruction, publications, meetings and other activities designed to advance and disseminate knowledge in agricultural economics" [2, Art. II].

It may be noteworthy that the new constitution omits language of purpose that had long been in the old one—that "of improving agriculture and agriculture's contribution to the general economy" [3, Art. II]. Is this a Freudian slip? Are we becoming more concerned for our discipline and less for agriculture?

Apart from the constitutional dedication,[3] there is evidence that slowly, scarcely perceptibly, we have been moving toward cloaking our Association with the habiliments of an active, program-oriented professional organization, one that is mutually self-serving and perhaps to a degree self-protecting.

One bit of evidence is the range of activities in which we engage, as illustrated by our committee structure. The proceedings number of the *Journal of Farm Economics* of December 1952 contained the President's report and four others. The December 1967 issue had those and three other housekeeping committee reports, and, in addition, reports from committees for publicity, research and teaching awards, distinguished extension award, handbook-directory, student affairs, graduate student evaluation and recruitment, contributed papers, agricultural data (joint with ASA), retrieval of literature, international research, and industry.

Other items of evidence are the things we do as shown by the budget. We sponsor a teaching-improvement seminar. We send some of our members to far-off meetings of the International Association. We reward and award on a half-dozen fronts.

All these activities extend far beyond publishing a journal and staging a once-yearly meeting. Nor does the *Journal* stand as our one Rock of Gibraltar. During my apprenticeship year as president-elect, more critiques and suggestions reached me on this than any other subject. Some members protest that the content departs too far from its onetime balance of general and special interest articles. Others say it has not grown in size proportionate to our numbers, and therefore it becomes harder to get a paper accepted. Some subgroups of our membership want the *Journal* to be sectioned off, with an allotment of pages made accessible to each such group.

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[3] The new Articles of Incorporation revert to idealized language: "This corporation is organized and shall be operated exclusively for educational and scientific purposes, all for the public welfare" [1, Art. III].

A whole chorus shouts that the *Journal* has become too mathematical.

One issue relates to the *Journal* as a medium for professional recognition. The charge is that graduate faculties in many universities look down their nose at in-house publications as earning professional recognition in research. They count only publication in refereed journals. This puts a premium, in terms of the career of research economists, on having access to a professional journal.

Two further pieces of evidence of a trend toward associational activism: (1) The committee on graduate student evaluation and recruitment has debated whether auspices of the Association should be drawn on to coordinate and/or standardize recruitment and evaluation practices in various universities. (2) Probably most ambitious of all proposals for service activities are those advanced by the literature retrieval committee. The preamble of that committee's report is pregnant with relevance: "The committee feels strongly that the next effort should be to plan steps that will enable AFEA to function as an articulate representative of the profession in matters pertaining to improved availability and use of the wealth of literature." Further, "The aim would be to provide adequate representation for the *various interest groups* in agricultural economics" (italics added) [10, pp. 2604–05]. Moreover, the committee would like the Association to employ staff to serve the common needs in this area.

Last of all, the executive board received a request that our Association serve as a source of support and defense in an alleged discrimination case. May I suggest that the possibility of our doing that on some occasion is not entirely far-fetched.

This is not a paper of advocacy. But if we were aggressively to promote mutual service projects, the opportunities are limitless. Consider textbooks, which range from superb to mediocre through wrong to nonexistent. Great as is the principle of free enterprise, it may need a little "assistance" if it is to provide us the optimum in teaching texts.

Many modern teaching aids, including TV clips, could be developed, provided that profession-wide utilization could be promised. The list could be long.

To summarize thus far, it is a major policy issue whether our Association continues to move toward a more operational role. There is empirical reason to believe we are in fact moving slowly in that direction. If we do go that way, we will find it necessary to gear up for it. This will mean more issues to debate and resolve, more human and financial resources to be employed—that is to say, more people to be put to work, and higher dues to be paid. This could be our prospect.

Another Association: The U.S. Department of Agriculture

Agricultural economists are not as aware of, or sensitive to, USDA affairs as they once were. During my long tenure with the Department I thought I was working in a goldfish bowl, with the eyes of 50 land-grant universities constantly peering at me. When I arrived at Missouri, I discovered that universities gratefully rely on USDA for data and otherwise almost disregard it.

Just as agricultural economists are troubled by questions of how tightly organized and how activist should be our organization, and of how much we should differentiate by subgroups, even so the USDA is sorely beset by organizational and procedural issues. To what heroic extent ought the Department to defend incomes of farmers? Is it supposed to feed the poor—*all* the poor? Is it the best agency to protect consumers by keeping meat and poultry clean? Does it speak just for the farmers, or also for rural communities? Is it the proper place for activities to preserve natural resources, or ought that responsibility to be lodged in the Department of the Interior? (Only recently Secretary of Agriculture Freeman rose once again to the defense of having forestry, watershed protection, and flood control in USDA.)

Basically, both the AAEA and the USDA are client-serving. The AAEA serves its nearly 6,000 members as individuals. On another occasion I declared that the USDA "has grown out of the unique manner in which U.S. agriculture is constituted—primarily its organization as many individual proprietorships." Moreover, "Farm operators . . . are small entrepreneurs of multiple talents. They have their own agent in the form of the Department of Agriculture" [5, p. 1].

Despite the claims of USDA to be a food agency and a conservation agency as well as the agent of farmers, in my view the Department came into being almost exclusively to provide the assistance that individual farmers have needed in an ever more complex world. To give that assistance is still its central mission in life.

If this be true, Agriculture joins Labor and Commerce as the departments of the executive branch of federal government that are set up to serve economic-interest groups.[4]

Early in the Department's history, the demands that an expanding agriculture made on it were primarily for scientific and educational help.

---

[4] Elizabeth Drew declares that President Johnson's proposal to merge Commerce and Labor was intended as a "way of releasing both from the grip of their constituencies," but it was "sacked by the labor unions" [6, p. 10].

From the beginning, the Department provided that help. For the purpose, it organized itself on the pattern of universities, and as late as the 1930's its bureaus were of soils and chemistry and agricultural economics. (The BAE survived until 1953.) The Department, from its first year, also distributed seed and collected and published statistics. It could be said to have had singleness of purpose.

Not so now. To traditional functions have been added a host of new ones. They arose innocently enough out of efforts to help depression-plagued farmers get a higher income and have since been caught in the postwar, worldwide tidal wave of governmental involvement in managing economic affairs. And so the U.S. Department of Agriculture is the world's biggest commodity trader and also biggest sales agency. It dominates commodity prices in commercial world trade in many farm products, and it may determine whether a starving Indian or African gets enough food to stay alive.

The Department's activities may be classified as follows: (1) Traditional services to an essentially free enterprise production and marketing economy. These include research, data reporting, information disseminating, and such market aids as commodity grading. (2) Commodity procurement, management, trading and selling. (3) Management of certain nationally held resources—principally the national forests. (4) Consumer services—mainly food inspection and labeling, and supplementary food programs. (5) Dispensation of financial and other aids, ranging from direct payments on wool, to conservation payments, to a dozen other kinds of grants and loans (sometimes called, derogatorily, the pork-barrel function). (6) Administrative and semijudicial surveillance over a number of activities in the agricultural economy, such as farmer marketing cooperatives and marketing agreements and orders.

In this or any other classification, one principle holds: to each category of action and responsibility there attach unique obligations; and the differences must be recognized in the organization for, and conduct of, Department affairs.

In my judgment, the USDA has evolved as such a rag-tag collection of agencies and activities that those basic principles have been violated.

First, though, a couple of caveats. These observations are in no sense an accusation of the performance of individuals. My target is not personal error but organizational incompatibility. Nor is the solution to be found in the attractive proposition that the answer to problems of government is to have less of it. The days of medieval simplicity in government affairs are gone. William Block's warning is more accurate: "The interrelationship of technology and government will expand government's role as regulator in the public interest" [4, p. 17]. In various respects government is not an appendage to the economy but an organic part of it. In discussing the place of the USDA and its multiple roles, Ray Goldberg put the case well: "The government is often an integral part of an agribusiness commodity system. . . . The public administrator becomes an active participant. . . . His roles may vary considerably: law enforcer, information center, educator, researcher, as well as an active participant in pricing, marketing, and production decisions" [8, p. 3].

Of the six categories, the two that interest us most are the traditional research and education activities on the one hand, and the commodity operations on the other. The commodity management activities hold the most power and are the most politically sensitive. The interests of those operations, expressed honestly and sincerely, conflict with various other activities and most sharply with the objectivity and academic-style integrity that must mark research, education, and statistical reporting.

Let me cite a couple of instances of built-in conflict. One relates to economic outlook work, an activity that probably best epitomizes the equilibrium-analysis economist applying his skills in the public service. The extent to which the commodity operations of the Department interfere with accurate and effective outlook work has seldom been acknowledged. What is the outlook for the price of grains? Ingenious statistical analyses are useful but equally relevant would be a reading on the state of mind of managers of the Commodity Credit Corporation. Very often, the prospects for prices of grain are affected crucially by the decisions of the CCC in managing its stocks. Or consider the unforeseeable Foreign Agricultural Service negotiations and policies with regard to exports, particularly in concessionary sales. On several occasions, the fall outlook for commodities such as soybeans, as published by the ERS, has proved too bearish, as the FAS followed its calendar of being conservative in September, hopeful in January, and proud of success in June. If the FAS were not so cautious in September, it could not look so good in June. All this is understandable and even rational, but it interferes with accurate outlook forecasting.

My own education on how the philosophies of state traders in commodities can affect departmental policies came during my tenure on a transportation review committee. This interagency group reviews transport rate cases in order to advise the Secretary on his policy stands before the ICC. Most of us worked from the conventional objectives of not only attaining low rates for farm products but also striving for equity among regions and products. In addition, we sought rates that would keep the marketing system competitive. Not so the CCC. As a commodity trader, its flight pattern calls for rates that reduce the cost of its particular shipping. Further, the CCC finds it simpler to deal with a few large firms than with many smaller ones and therefore leans towards minimum rates for those firms, however discriminatory. Conflict of interest within USDA? Yes, indeed!

What about research? On this I choose words carefully. Doubtless both physical research and economic research remote from Department operating programs are safely insulated. As to whether all economic research is untouched, the test is whether the mandate of separating general economic studies from operating program analysis is being observed. For every economic program, program analysis should be conducted. But it should be identified as such and sharply distinguished from traditional economic studies. Although on the whole I retain confidence, I also acknowledge a major obstacle, namely, the publication policies of the Department. These seem to be directed mainly to ensuring that nothing shall be released that is derogatory toward the Department's operating programs or policy stands.

The most gratifying record in USDA is that of statistical reporting. A moral can be drawn: it is that one reason for the total rectitude is the impregnable defenses thrown up by the statistical agency itself. This is a moral because it violates the principle of lines of command on an organization flow chart, converging in the office of the top officer. The actual state of affairs is consistent with Galbraith's idea of satellite independence born of technocracy. But even here there is a disquieting note, for Secretaries of Agriculture on occasion have decreed the language to be used in reporting price trends. This would be trivial except for the disquieting question of whether communication is accomplished only by numbers, or by text too.

The segregation of commodity programs, including program analysis, from conventional economic work is made more difficult by one grievous error in the Department's administrative structure. It is the placing of the Director of Agricultural Economics in the ambiguous and conflicting double assignment of supervising the Department's economic and statistical functions on the one hand and serving as the principal policy advisor to the Secretary on the other. Although the record of incumbents in that position is exemplary, this does not divert from the basic structural flaw which invites compromising one in favor of the other.

Lastly, the quasi-judicial responsibilities of the Department. No role of the agency and the Secretary is more sensitive and more vital or more urgently requires spotless performance. In several assignments the Secretary plays such a role. One is the regulation of public livestock and poultry markets under the Packers and Stockyards Act, and of commodity trading under the Commodity Exchange Act. A second is the administration of marketing orders and agreements. This second kind of assignment could become more general if U.S. agriculture should go the bargaining route that many groups advocate. In most bargaining proposals, the Secretary is given a combined administrative and umpiring function.

A common technique in administering marketing orders is the public hearing. This provides for airing opposing views, for rendering an objective and impartial decision based on the findings, and for publishing the decisions and the reasons therefor. To work fairly, such a system must be governed by a code of procedures. For many years this was the common law concept of due process, but in 1946 the Congress enacted the Administrative Procedure Act. A primary clause in the Act requires that whenever a decision is required by statute to be based on evidence in a record, the only evidence to be considered is that which is brought forth in the record of the hearing and made public. Implementing this provision, the USDA has long had an internal regulation decreeing that once the hearing is closed, no member of the Department shall discuss the content of a marketing order hearing with any interested party.

It is a distressing fact that in recent years the conduct of top USDA officials has been a travesty on this due process rule. The most glaring disregard has been in milk order affairs. In my observation, the public hearing has sometimes been little more than motion necessarily gone through. Milk order decisions during more than a year, and dairy price support decisions as well, were scarcely more than a tangential offshoot of the President's courting of the chairman of the House Ways and Means Committee with respect to tax increase legislation. The latter gentleman has strong dairy interest backing.

The climax came in the decision to lift dairy price supports this year to the maximum permitted by law. It has been reported widely and reliably that the decision was made at the highest executive level in the political setting I have just named.

All this is maladministration of extremely important responsibilities of the Secretary of Agriculture. Affected thereby is the welfare of whole industries, not to mention that of consumers of food. Also, a serious consequence is the damage done to the sense of integrity and the esprit de corps of professional staff of the Department.

Other searching questions could be posed as to the situation in which the U.S. Department of Agriculture now finds itself. If, as I believe to be true, the Department was originally described in terms of its farmer clientele, structural changes in farming now create some confusion. Still ringing in my ears is the plaint of a cooperative leader who had favored the poultry marketing orders the Department leadership proposed six years before. Said he, "The Secretary might have gotten someplace had he known who his farmers are." Integrators are a different interest group from growers, and the difference is recognizable without implying partiality.

If the USDA combines too many activities having too diverse and too conflicting functions, the obvious next question is that of prescription. It is not to chuck the whole kit and caboodle. Rather, it is to devote more brainpower to discovering how to manage government operations better.

The first correction would be to separate functions of various types. Some persons would remove the traditional research, educational, and statistical activities to a safe haven. Some advocate taking consumer service responsibilities out of USDA. There is no lack of proposals. In my view, it is the commodity operations that are the source of most of the political and economic pressure, and I think it wiser to remove them from the USDA. How best to provide for management of commodity operations is not clear. In some countries, there is a governing board that combines members from the commodity sector and from the public. Definitely and absolutely, any arrangement must provide for representing the public interest in some manner—and effectively so. As an illuminating example, when, following the shorter grain crops of 1966, the CCC disposed of some grain and thereby restrained price advances, a number of farm groups protested loudly. Their castigation of Secretary Freeman was undeserved and unfair, even though their sense of the awesome power of the CCC was accurate. But when some leaders proposed letting a farmers' CCC take over and manage all trading unmolested, they were far off base.

The quasi-judicial activities of the Department absolutely *must* be treated as such, and guarded meticulously. They too should probably be removed to separate commissions attached only loosely, if at all, to the Secretary of Agriculture.

Perhaps it has proved clumsy to combine the AAEA and the USDA in this paper. But parallels there are. The ills of the USDA are not ascribable to personalities but to the outcome of an administrative structure that was never designed for the load it is now carrying. We in AAEA are changing our structure; and between AAEA and USDA there is a common chord of the meaning of a more associationistic texture to affairs of our time—whether minute as in the case of our professional association, or giant as in the agricultural arm of the federal government. However reluctantly, I suspect that the AAEA is going to go the route of serving more than before as a vehicle for communication and mutual service, and possibly even for defense and support in the face of adversity. Just as the USDA needs total reorganization, augmented by a new and enforceable set of rules of administrative procedure, even so will the American Agricultural Economics Association want to give thoughtful attention to how it can best conduct its internal affairs in years to come.

And since associationistic issues will persist, is it conceivable that our discipline will once again become a branch of political economy?

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INVIDED LECTURE

Chairman: Stephen C. Smith, University of Wisconsin,
President WAEA

Institutions and the Rising Economic Value of Man*

T. W. Schultz

I TAKE it to be true that there is a strong connection between the investment in human capital and the secular rise in the economic value of man. The institutional implications of this development are, however, far from clear. My purpose is to show that the rise in the economic value of human agents makes new demands on institutions, that some political and legal institutions are especially subject to these demands, that there are lags in adjusting to the new demands and these lags are the key to important public problems, and that economic theory is a necessary analytical tool in clarifying and solving these problems.

It might be said that human capital is protesting the status quo of institutions as it seeks participation rights for itself. Be that as it may, there is enough historical perspective to see that the ownership of land is declining as a source of economic leverage, and so is the ownership of physical capital relative to that of human capital. We have long known that Ricardian rent is not the fulcrum of economic values; nor is physical capital the critical historical factor, as Marx believed. The institutions governing private rights in land and in other forms of physical capital when Ricardo and Marx made their contributions would be far from adequate in contemporary society with its large investment in human capital. Would that economics could have been blessed by the marriage of Irving Fisher's all-inclusive concept of capital [4] and John R. Commons' legal foundations of that capital [3].

It is currently a mark of sophistication in presenting economic models not to mention institutions. But for all that, it is a significant trait of contemporary economics that, despite this omission, it manages somehow to find support for institutional changes. It is a neat trick, but it cannot hide the fact that, in thinking about institutions, the analytical cupboard is bare. There are a few old boxes on the back shelf labeled "institutional economics" which have been pushed aside and which have long been

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T. W. Schultz *is Charles L. Hutchinson Distinguished Service Professor, Department of Economics, University of Chicago.*

thought to be empty. When we look more closely we find that there are virtually no terms of reference, no concepts with specifications that can be identified, and no economic theory to guide the analysis. Yet it is obvious that particular institutions really matter, that they are subject to change and are, in fact, changing, and that people are trying to clarify social choices with regard to alternative institutional change to improve the economic efficiency and the welfare performance of the economy.[1]

My plan is, first, to define and comment on the attributes of the institutions that render services to the economy, then to present and evaluate three approaches for the analytical task at hand, and lastly to use the third of these approaches to explain particular institutional lags in adjusting to the rise in the value of human agents.

Institutions That Render Services to the Economy

I shall define an institution as a behavioral rule. These rules pertain to social, political, and economic behavior. They consist, for example, of rules that govern marriage and divorce, rules embodied in constitutions that govern the allocation and use of political power, and rules that establish market capitalism or governmental allocation of resources and of income. Since I shall deal only with those institutions that perform economic functions, I shall leave aside all institutions that perform purely social functions. It is my aim to consider particular political, including legal, institutions that in one way or another influence, or are in turn influenced by, the dynamics of economic growth. It is a concept of institutions which takes me into the domain of political economy. A partial list includes the following institutions: (1) those that reduce transaction costs (for example, money, futures markets), (2) those that influence the allocation of risk among the owners of the factors of production (contracts, share tenancy, cooperatives, corporations, insurance, public social security programs), (3) those that provide the linkage between functional and personal income streams (property, including inheritance laws, seniority and other rights of labor), and (4) those that establish the framework for the production and distribution of public goods or services (highways, airports, schools, agricultural experiment stations).

Some elaboration of the economic role of these institutions may be in order. There are those that belong to an older vintage. Money, clearly, is one of them. As the quantity of international transactions increases, the supply of international money may be subject to serious stresses. Consider the process under way to internationalize "paper gold," thus presumably freeing the supply of high-powered money from the constraints that determine the production of gold. Closely related are credit instruments, including debts. I recall, with pleasure, the first assignment by John R. Commons asking those of us in his class to search for the historical circumstances that gave rise to the negotiability of a debt. The legal assignment of private rights in property is still, obviously, an important institution, the economic implications of which remain high on the agenda at Wisconsin, especially so in agricultural economics. Contracts, of course, are a viable institution, and they also are undergoing change, for example, in obtaining access to the capital market to invest in oneself, the formation of human capital.

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[1] A part of the literature pertaining to welfare economics is relevant here. The *Journal of Law and Economics* is a rich source of papers on the economic implications of property rights; the contributions in it by Coase are especially noteworthy. Still another relevant source is the work by Anthony Downs in bringing economic theory to bear on political decisions.

A recent vintage includes the legal rights of labor; they now loom large. But they, too, are in a state of flux, with many unsettled issues. The rights to organize and to use all of the bargaining power that organized labor can muster can impair economic efficiency sufficiently to induce the political process to alter some of these rights. Meanwhile, the rising economic value of man is compelling society to establish additional rights favoring the human agent. Organized economic planning by government is another recent institution, with respect to which advances in economic theory have contributed much in clarifying the function of prices, whether they are market prices or shadow prices, in allocating resources guided by organized planning. Lastly, I shall mention the institutionalization of public transfers of income. But here, too, the guiding principles and the appropriate arrangements are still far from settled.

It is hard to believe that institutions such as these are protected by Nature in ways which make them immune to economic analysis. The analytical job is to specify their functions, measure their influence, and determine when they are efficient. To get on with this task requires a theoretical approach from which testable hypotheses can be derived; and these hypotheses, we may hope, will lead to empirically supported propositions pertaining to the economic performance of these institutions.

Approaches to the Dynamics of Economic Growth

First, there is the approach that omits or impounds institutions by abstracting from them. As noted at the outset, this is the approach of modern economics. We have a large family of growth models that treat institutions as a part of the "state of nature"; thus, institutions are impounded and they are not subject to change, either exogenously or as a variable adjusting to the dynamics of growth. There are some short-run growth problems that can be treated in this way, but most growth problems cannot be solved in this manner. Modern economics with all of its analytical tools is not up to the job of analyzing the connections between institutional changes and growth dynamics.

Second, there is the approach that treats institutions as subject to change exogenously. In this approach, institutional changes may matter, but the critical simplifying assumption is that these changes are independent of economic growth. Accordingly, institutions are treated as an exogenous variable in the sense that they are altered by political acts, including legal decisions, independent of the process of economic growth. There are, undoubtedly, some institutional changes that are of this type and, in considering their economic effects, it is an appropriate approach. But most institutions that perform economic functions undergo change in reponse to the requirements of the dynamics of economic growth, and the nature and strength of these responses are not within the province of this scheme of analysis.

I would be remiss if I did not give credit to those few hardy economists who remain committed to "institutional economics." They are concerned predominantly with the allocation of property rights in natural resources and they are best known for their analyses of and arguments for land reform. The essence of their work is to begin with an ad hoc institutional change. It is, therefore, not an approach that treats an institution as an endogenous variable in an economic growth model. It is primarily concerned with the effects of a particular reform upon the distribution of personal income and welfare. It is not guided by economic theory, no doubt in part because theory has so far not integrated the functional distribution of income and the distribution of personal income. Likewise, institutions that produce human capital (for example, education and on-the-job training), institutions that are the source of technical change (for example, research and development), and laissez faire competition are also usually treated in this fashion.

Third, I propose an approach that treats these institutions as variables within the economic domain, variables that respond to the dynamics of economic growth. Although not all institutional changes can be treated thus, there is a large and important set that can be taken on analytically in this manner.

Instead of omitting or impounding these institutions in the "state of nature," or introducing them on an ad hoc basis, the analytical task is to bring them into the theoretical core of economics. To get on with this task, two key concepts are required, that is, the economic value of the function performed by an institution and the concept of an economic equilibrium. First, how are we to get at their economic value and the factors that determine their value? We begin with the assumption that these institutions are suppliers of particular services. They may supply a convenience, which is one of the attributes of money; they may supply a contract which reduces transaction costs, as in the case of leases, mortgages, commodity futures; they may supply information, as do markets and economic planning; they may pool particular risks, which is an attribute of insurance, corporations, cooperatives, and public social security arrangements; and they may supply public goods (services), as in the case of schools, highways, health facilities, and experiment stations. For each of these services there is a demand. It is, therefore, within the province of economic theory to approach the determination of the economic value of each of these services by subjecting them to a supply-and-demand analysis.

The next analytical step is to place this supply-and-demand approach into an equilibrium framework. The key assumption in taking this step is that an economy arrives at an equilibrium with respect to each of these economic services of institutions when the rates of return represented by these and other services reach equality.

Consider now several variants of the process of economic growth. Suppose that it were conceivable that an economy could produce additional income streams over a period of time in such a manner that everything would increase in exactly the same proportion. If this were to occur, presumably there would be no disequilibria, and thus the economy would not be confronted by the problem of returning to an equilibrium. But in explaining actual economic growth as we observe it, growth models built on this assumption are, so it seems to me, toys rather than analytical tools.

The process of modern economic growth is beset by all manner of disequilibria which are consequences of the growth process. Institutions that perform economic functions are not spared. Some of these disequilibria persist and even become chronic, as anyone who is informed about economic problems confronting U.S. agriculture knows. It is obvious that we are involved in a long-standing disequilibrium, which has burdened human agents in agriculture greatly and which still persists despite the extraordinary migration out of agriculture. Bishop, in his perceptive and challenging presidential address, clearly identified the lags in adjusting community institutions [2]. With respect to this and other disequilibria, the questions to ask are these: How strong is the tendency towards equilibrium? Can it be strengthened? Can the lags in the adjustment be facilitated at a cost where the benefits will exceed the costs?

By way of summary, then, our theory is designed to explain those changes in institutions that occur in response to the dynamics of economic growth. The institution is treated as a supplier of a service which has an economic value. It is assumed that the process of growth alters the demand for the service and that this alteration in the demand brings about a disequilibrium between the demand and the supply measured in terms of long-run costs and returns. Although it is possible for the supply of the service of an institution to be altered independently of economic growth considerations, our theory cannot explain such a change in an institution; it can be used, however, to determine the resulting effects of such a change.

I shall digress at this point and consider briefly several testable propositions pertaining to institutions and agricultural production in countries that have long been in equilibrium of the type that characterizes traditional agriculture [11, chap. 2]. Suppose that the policy objective is to attain a sustained rate of increase in agricultural production and the rate of increase is both efficient in economic terms and higher than the rate associated with population growth (farm labor) in the case of traditional agriculture. In negative terms, I would offer the following propositions: (1) a planned increase in the supply of money at a rate that would be higher than formerly will not suffice to bring about the desired increases in agricultural production, (2) nor will an institutional reform that would increase the supply of credit available to farmers achieve the objective, (3) nor will a change in tenancy laws that would reduce the share rents of tenants bring about the desired sustained rate of increase in agricultural production.

Let me now reformulate these and closely related propositions in positive and more readily testable terms. When agriculture acquires a growth momentum, as it recently has in many parts of Asia (China aside for lack of information and Japan aside for reasons of her prior successful modernization of agriculture)—a growth momentum that is a consequence of favorable farm product prices, the available new varieties of foodgrains that are responsive to fertilizer, and a cheaper and larger supply of fertilizer—the dynamics of that growth will induce farmers in these parts of Asia to demand institutional adjustment. They will demand a larger supply of credit, with stress on its timeliness and terms, and they will organize cooperatives should these be necessary for this purpose. They will demand more flexibility in tenancy contracts. They will join with neighbors to acquire tube wells and to undertake minor investments to improve the supply of water. Both tenants and landowners will also use whatever political influence they have to induce the government to provide more and better large-scale irrigation and drainage facilities. These are all testable propositions. There is, so it seems to me, a growing body of evidence in support of each of these propositions.[2] So much by way of digression. I now return to the mainstream of the analysis.

Thinking in terms of the economic incentives for institutional responses, incentives which are a consequence of economic growth, there are several more general propositions: (1) In a market economy which is achieving growth, the demand for the convenience of money shifts to the right. (This proposition is supported by competent empirical studies.) (2) In an economy in which the income per family is rising, the demand for contracts and property arrangements serving the economic activities of the nonfarm sectors increases relative to that associated with the farm sector. (This is an obvious proposition.) (3) As economic growth becomes increasingly dependent upon the advance in useful knowledge, the demand for institutions that produce and distribute such knowledge shifts to the right. Here we have a modern development with respect to which the less-developed countries are in general substantially more in disequilibrium than are the technically advanced countries [9]. (4) When economic development reaches the stage at which the economy requires increasingly more high skills, the demand for high skills that require schooling, including higher education, increases relative to the demand for low skills and for reproducible forms of nonhuman capital. (There is a strong evidence that the U.S. economy has been in this stage since World War II.) (5) The proposition on which I shall concentrate during the remainder of this paper is as follows: In an economy where growth increases the economic value of human agents, the demands for services of a number of different institutions are altered by this type of growth. As human lives become less cheap, the demand per worker for additional safeguards protecting workers from accidents shifts to the right; so does the demand per person for health services and for life insurance. The demand for additional legal protection of personal rights (for example, protection from invasion by police that impairs the privacy of persons) also shifts to the right, as does the demand more generally for civil rights. As a factor in production, human agents demand greater equality in obtaining jobs, especially so with respect to jobs that require high skills. Closely related is the increase in the demand for less discrimination in having access to schooling and higher education to acquire the higher skills. As consumers, human agents demand greater equality in having access to consumer goods and services, notably so in the case of housing and family planning information. Then, too, as the value of a person's time rises, there is allocation toward good-intensive rather than time-intensive consumption activities [1].

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[2] I am indebted here to W. David Hooper and his formulation [6].

Institutional Lags in Adjusting to the Rising Value of Man

It is my thesis that the remarkable secular rise in the economic value of human agents that has been and is occurring in the United States is the source of major disequilibria in the economic functions performed by institutions. Let me be explicit in noting that it is not my contention that all of this rise in the economic value of human agents is wholly a consequence of the type of economic growth that characterizes our economy. A part of it, but surely a small part, is a result of the curtailment of the immigration of persons who are allowed to enter from abroad to become members of the U.S. labor force. The extension of civil rights, the additional public provisions for legal services for the poor, the programs to alleviate poverty [5], and the Supreme Court's decisions with regard to schooling are developments that have enlarged the choices open to individuals. Although it might be argued that these developments, including urbanization as an intermediate influence, were not dependent upon the growth of the economy enhancing the economic value of human agents, it is a superficial view if it is true, as I contend, that these developments are predominantly a consequence of the type of economic growth which has been and is occurring in the United States. These legislative acts and legal decisions, in large part, were made possible and necessary because of the process of economic growth. In brief, these legislative and legal developments are lagged accommodations to the profound institutional stresses and strains brought about by the marked secular rise in the economic value of human agents.[3]

It is hard to imagine any secular economic movement that would have more profound influence in altering institutions than would the movement of wages relative to that of rents (that is, the price of the services of property). I am sure that economic historians would find the secular movement of wages relative to rents a rich vein. Showing the symmetry of the institutional changes that follow in the wake of such movements, regardless of the type of government, is one of the major contributions of Slicher Van Bath [12]. We are presently in a long secular movement which is running in favor of the economic value of the human agent.

Clearly, then, the institutional changes that occur in response to the rising economic value of the human agent call for a family of new economic models. I shall consider briefly three that belong to this family, namely, (1) institutional responses to increases in the market price of work, (2) institutional responses to increases in the rate of return to investment in human capital, and (3) institutional responses to increases in consumer disposable income.

First, assume that economic growth increases the value productivity of workers per unit of time (and thus the wage per hour) relative to the rate of return to investment in property, and also that the value productivity of workers with high skills increases in absolute terms compared to that of workers with low skills. What are the institutional implications? What is implied in terms of substitution possibilities? At the level of allocative decisions made by firms operating for profit, we are not burdened with serious institutional rigidities in our type of competitive market economy. Contracts, including leases entered into by tenants in agriculture, are a case in point; there is, of course, a lag, but it is not a long lag in adjusting such contracts to changes to the better earning opportunities of human agents. What is true, however, in a national context is that workers with low skills have access to less job information than workers with high skills, and, in the case of the higher skills, there is job-market discrimination against nonwhite workers.

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[3] Albert Rees has called my attention to the fact that courts are more and more explicitly considering earning power in determining the size of the judgments in cases of accidental injury or death.

The institutional lags pertaining to wages that arise out of the dynamics of economic growth are predominantly in the realm of internal migration, occupational shifts, and discrimination against nonwhites. These lags are revealed in terms of less-than-optimum job information, less on-the-job training than is consistent with an equalization of the social benefits and costs of such training, and living accommodations in job-expanding areas which are in part rationed by discrimination. In the report, *The People Left Behind* [8], we have a landmark in analysis and recommendations for lines of public action to reduce the institutional lags in this general area.

Second, in approaching the problem of investing in man, the key assumptions are that economic growth is of a type in which the production activities require relatively more high skills than formerly and that the derived demand from these activities increases the rate of return to investment in human agents. Again we ask: What are the institutional implications?[4] Looking back, it would appear that our system of education has been flexible in expanding the supply of education services sufficiently to accommodate the private demands of middle and upper income families. The rub is, however, that it has lagged seriously in supplying additional educational services, both quantitatively and qualitatively, for many children of farm families, for poor whites generally, and, most patently, for Negroes. In terms of social rates of return to investment in poor people, there is a growing body of evidence that supports the inference of a continuing disequilibrium, especially so with respect to elementary and secondary schooling. Higher education is an institution that raises complex and difficult organizational issues. The tendency toward an efficient allocation of resources is weak; economic incentives and information are in poor repair. The self-interest of students is not mobilized adequately, the accounting of social benefits (losses) is haphazard, and academic entrepreneurship is in a box which provides all too little opportunity for allocating resources efficiently. Since I have considered elsewhere the problems associated with resources for higher education [10], I shall not elaborate further here.

Third, in thinking about institutional lags that impair consumer sovereignty, the central problem is that of accessibility where rationing occurs as a consequence of discrimination. Here, too, let us assume that disposable consumer incomes rise as a result of economic growth. Although it is true that in general market forces have a strong tendency to adjust to the changing demands of consumers, it is not true in the case where particular consumer goods and services are subject to market discrimination between people by color. There is little room for doubt that many Negro families with rising incomes are subject to such markets in traveling, at least until very recently, in acquiring health services and family planning information and techniques, and, above all, in renting or purchasing housing.

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[4] Professor Earl J. Hamilton has reminded me of the insights of Alfred Marshall on some aspects of this issue [7, Bk. 6, Chaps. 12, 13].

Finally, it must be said, when the economic value of human agents is rising, we are in the realm of new and better opportunities. The range of private and social choice is enlarged. It is, indeed, an optimistic set of circumstances that all too few people of the world enjoy. But even so, this favorable type of economic growth is not without its institutional stresses and strains. Since we can specify and identify these institutional lags, we can also analyze the benefits in terms of the efficiency and welfare that could be had by reducing these lags. Meanwhile, it is not simply a matter of catching up, because there are strong reasons for believing that the economic value of man will continue to rise.

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The Collapse of the Gold Exchange Standard

ROBERT A. MUNDELL

I CAN think of few places in the world where the subject of my remarks would appear to have less relevance. The "Big Sky" country reminds one of the vast continental dimensions of the United States and how closed the United States economy really is compared to other countries, except for Russia and China. At Billings airport there is a prominently displayed quotation by Herbert Hoover which says that the metal resources of Montana exceed those of all the known resources in the Soviet Union. If that were true (and I very much doubt it!) Montana itself would have to be a very open economy in order to profit from them. One can easily imagine the problems this state would have if the financial apparatus in the United States broke down. But the position of Montana vis-à-vis the United States is not very different from that of many nations in the world confronted with the threat of international financial breakdown. So, on second thought, Montana is not such an impossible place to speak about international monetary disorder.

The Exchange Market Collapse

The financial problems with which the world economy is confronted have their roots in obsolete intellectual attitudes. When change outpaces understanding, we become the victims rather than the masters of governing historical forces and get inveigled into wrong interpretation and prognosis. It is to improve such interpretations that this paper is devoted.

Only a couple of years ago the world monetary system looked very different from the way it appears today. This is because of the devaluation of sterling and the breakdown of the gold exchange standard in the form we used to know it. But the real problems of the system have not changed as much as they appear. Had you asked central bankers in 1966 to specify the major problems facing the world monetary system they would probably have said: Restoring the strength of the pound and the dollar, which means ensuring the ability of Britain to maintain her exchange rate and of the United States to continue convertibility of the dollar into gold at $35 an ounce. And had you asked, How should Britain and the United States go about this? they would have answered: By correcting their balances of payments through less inflationary policies or whatever other means were available. But they would say something similar today, although it would be tempered by greater caution and less dogma.

ROBERT A. MUNDELL *is professor of economics at the University of Chicago.*

Only a year ago events had altered attitudes. The United States had braked the inflationary boom of 1965-66 by dear money; this occurred between June and November 1966. Soon after, interest rates fell and the Federal Reserve was faced with the threat of recession. The U.S. authorities reversed policies and expanded, a move which coincided both with the needs of the U.S. economy and with the recessions in Germany and France. The U.S. monetary ease was bad for her balance of payments but good for the United States and the world economy. Criticism of U.S. inflationary policy was much more muted in 1967, and the time became ripe for reform.

On March 17, 1967, Secretary Fowler issued at Pebble Beach, California, what was widely interpreted as an ultimatum to the Group of Ten to create a substitute for the dollar in the form of a new international reserve or else face the prospect of a reconsideration of the U.S. commitment to her current gold policy. The London agreements reached at the end of August 1967 owed much to the hard intellectual work of the Group of Ten, but their timing was hastened by pressure from the U.S. Treasury. The outcome was an agreement to propose at the IMF Governor's Conference later in September a new international asset called "special drawing rights." The barbaric name for them was due to the need to compromise between the French officials, who considered them as a credit instrument, and the U.S. officials, who considered them money.

Official reaction to the agreement was enthusiastic. It was heralded at the time as a "milestone in international monetary cooperation," "the most important step since Bretton Woods," and other wildly enthusiastic examples of oversalesmanship. This was to be expected, since the agreement was the outcome of official policy. The general reaction of economists was much less exuberant, and a few economists, including myself, and perhaps Sir Roy Harrod, regarded these drawing rights as positively harmful. One argument was that they would distract attention from the more fundamental problems facing the world system and that, although their long-run potential was substantial, the major hurdle was to get beyond the immediate short run. Solution of the short-run problem would involve substantial changes in the structure of the system, and the long-run creation of a new international money should be integrated into or evolve out of this short-run reconstruction of the system.

The official answer to this was that the public should not expect the SDR's to perform a function they were not intended to perform and that the planting of a seed today would generate greater confidence in the stability of the system: the SDR's could, indeed, be used as a substitute for gold and thus reduce the speculative demand for it.

The IMF Rio meetings (September 1967) reflected the optimism of the U.S. Treasury and the euphoria generated by belief in the gigantic new step that the birth of the infant SDR's was expected to involve. It was, indeed, a remarkable event, with the leaders of the financial world assembled and engaging in mutual criticism and self-criticism of one another's economic policies. It was a development no one could have conceived of 30 years ago, and even 10 years ago the attitude would have been far different.

Nevertheless, despite the excitement of a great new experiment, there was a cloud overhanging the meeting. The plight of sterling was a great unspoken issue. It was common knowledge that the Bank of England had accumulated massive short-term debts and assumed substantial commitments in the forward market, although not many could form an accurate assessment of their size. The questions facing British authorities (and the other central banks) were (*a*) *Can* Britain hold the sterling rate? (*b*) *Should* Britain hold the sterling rate? (*c*) *Will* Britain hold the sterling rate? and (*d*) What, if any, international steps can or should other members of the Group of Ten or the Fund take to assist Britain, either by consolidating her debts through a long-term loan or by placing them in an international account?

These questions were all resolved in the third week in November. By Tuesday night the British had apparently decided upon devaluation and dutifully notified a restricted group of the international community. Internal activity immediately began on the exchange markets, leading to rumors of a leak, and by Friday Britain had lost vast sums, forcing the market to close before normal closing hours. The rate change was announced over the weekend, a devaluation of 14.3 percent (from $2.80 to $2.40). In the wake of sterling devaluation, most of the sterling area countries followed, although this was much smaller than it was in 1949.

Australia, significantly enough, did not devalue. She was looked upon as a key country from the standpoint of preventing a proliferation of devaluation. A phone call from the U. S. President to the Australian Prime Minister made clear her importance; in particular, the United States was afraid that devaluation by the Australians might be the straw that broke the camel's back. For example, it might prompt devaluation of the Japanese yen, which in turn would influence rate decisions by Canada, France, and other countries. Australia was the marginal country.

Just another devaluation? Hardly. It coincided with the British decision to dismantle military positions east of Suez, so historians, with their fondness for dates, might well pick November 18 as the most convenient date to set for the fall of the British Empire, as they picked the Treaty of Adrianople (378) for the fall of the Roman Empire.

Seriously, however, the British devaluation showed that coordinated action by a major currency, in a world in which at least one of the powers (France) is trying to rock the boat, is impossible. Britain had scrupulously abided by the rules of international commitments in her handling of the devaluation, but I very much doubt that the British would act so virtuously in a subsequent devaluation. Nor would France, Germany, or the United States. Virtue is too expensive! The next rate change may well be a unilateral move.

France bears some share of the blame for the embarrassment of the British authorities in November. In the year leading up to devaluation, the world could witness the unprecedented event of a major country calling openly for devaluation of the pound. This was part of a package deal necessary if France was to withdraw her veto of British membership in the Common Market.[1] The position of sterling might have been shaky enough in any event. The British had never made the major readjustment that was required to set sterling on a sound footing throughout the 1960's, and (at least this is my view) she still conducted her monetary policy as though she had a flexible exchange system [Robert A. Mundell, *International Economics*, New York, the Macmillan Company, 1968, Chap. 19]. But the French attack was, nonetheless, outrageous.

The cleaning-up process was (not unexpectedly) disorderly. In the aftermath, the United States lost hundreds of millions of gold. The last quarter's gold losses were so alarming that President Johnson felt compelled to pre-empt the bad announcement effect by introducing "strong measures to put the balance of payments in order," including special taxes on travel and further prohibitions on foreign investment.

The depressing aftermath is well known. A well-organized union of interests of France, South Africa, the gold lobby, and (so it was rumored) Russia, colluded to establish a bullish market for gold, both by stimulating private speculation and by an arrangement through which South Africa (and perhaps Russia) would withhold gold from the market. At the same time, discussion in the U.S. Senate about changing the U.S. commitment to gold created alarm abroad. The gold pool (which France had abandoned in June 1967) faced mounting losses. A run started and the gold drain reached crisis proportions by the third week in March, until, in a communiqué issued on March 18, the authorities announced that they would no longer supply the private market. Gold was to circulate among central banks at $35 an ounce, but central banks were not to buy or sell in the private market.

Thus ended the Gold Exchange Standard, the system in force since 1934. The warning that Triffin had sounded back in 1959 had found its mark.

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[1] The other provisions were that Britain withdraw from positions east of Suez, that she abandon her Commonwealth connection, and that she give up her special relationship to the United States. As far as I am aware, Britain was to be allowed to keep her language.

The Struggle to Save the System

It is worth pausing a moment to reflect on this episode. Triffin had posed in 1959 the dilemma of the gold exchange standard: if the United States cured its balance of payments, the world would run short of liquidity, but if it did not cure its balance of payments, the gold exchange standard would break down. The seeds of destruction were contained within the system itself.

We have seen how Triffin's prediction was vindicated. It is really quite remarkable. For ten years, the U.S. Treasury and the IMF first denied the Triffin dilemma, then wrestled with it, and finally sought a way out of it. But the remorseless logic of the system did not pay any attention.

Think of it. There, on the one hand, is the evolutionary logic of the system intent on its inexorable suicide. Against it are arrayed the most capable forces in the financial chancelleries of the world, fighting against the tide.

It does not matter when we date the opening shot in the struggle. Eight years ago is as good a time as any. October 1960 was the month of the gold bubble, the pre-election month in which communications broke down between the Bank of England and the Federal Reserve System, and the price of gold shot up in London to $40 an ounce. At that time the matter was settled when President-elect Kennedy gave his pledge that the dollar would not be devalued, a pledge that announced the opening of the Great Struggle.

The first real battle was waged a few months later. Speculative capital movements had aggravated bad policies in Britain and Germany; and in March 1961, the Germans raised the price of the mark by 5 percent. This took place while the governor of the Dutch Central Bank was in South Africa, and it created considerable confusion and delay until the Dutch followed the Bundesbank by raising the price of the florin. But the significant fact was that the up-valuation of two of the strongest currencies on the Continent brought speculative capital *to* Germany and Holland; it aggravated the speculative capital flow because the market thought up-valuation, if it were to take place at all, was inadequate. There was little point to such a small rate change; it only served to excite the market and remind the financial world that the exchange system is an adjustable peg system and not a fixed exchange system.

There followed, in the years 1960–1968, a number of fascinating battles fought to hold the system together. Notable crises concerned sterling in 1961, the Canadian dollar in 1962, the lire in 1963, sterling in 1964, 1965, 1966, and 1967, and the Canadian dollar in January 1968. There is currently going on, as you probably know, a battle to save the franc (or else prepare the franc for its devaluation), to strengthen the pound, and to weaken the mark.

It is more interesting, in any case, to sketch in perspective the elaborate system of defenses set up to protect the dollar. These were based, unfortunately, on two faulty principles: (*a*) that foreign aid should be based on balance-of-payments considerations and (*b*) that the balance of payments should be looked at piece by piece, not as an integral part of a general equilibrium system. These two principles are two major fallacies on which every beginning economics student has to cut his teeth. According to one, Portugal, Peru, and Thailand should provide foreign aid to the United States; the other leads to a game of musical chairs in which the plugging of one hole only pushes more gold out of the other. On the basis of these faulty principles, the U.S. authorities tied U.S. aid (1960), controlled the spending of troops in Europe, put a "temporary" tax on foreign securities (1963), put quotas on bank lending abroad (1965), and instituted a system of controls over direct foreign investment.

These measures did not correct the U.S. deficit, as theory suggests that they would not; they merely permitted a higher price level in the United States. They do, however, have real effects and help to accomplish other objectives. This raises the interesting sociological question as to whether the measures were *intended* to correct the U.S. deficit, or whether the deficit was only an excuse used to conceal their real purpose. Most of these measures turn out to have significant effects in improving the U.S. terms of trade on capital account.

Some support for this interpretation can be got from statements which President Kennedy apparently made to his economic advisers even before assuming the presidential duties. Early in his administration he had, furthermore, warned that, although the United States would work to correct the balance of payments, it would not use deflationary policy, impose controls on exchange, raise tariffs, or devalue the dollar—that is, it would not undertake any effective balance-of-payments policies!

International Remedies

With remedies at home ruled out, attention had to be directed to international solutions. By 1961 there developed an intensive movement toward monetary cooperation. The Roosa era began with U.S. activity in the foreign exchange markets, the introduction of foreign-currency-denominated dollar assets (Roosa bonds), and the beginning of discussion about the need for international monetary reform.

The two horns of the Triffin dilemma were now clearly visible. Continental Europe (especially France) grabbed hold of the one that said: Correct the U.S. deficit. The United States and Great Britain grabbed the other that said: Prevent the liquidity shortage that correction of the deficit would create. The Europeans said to the United States: If you correct the deficit, and then the need for liquidity is felt, we can then go ahead with reforms. But the United States responded that it was silly to correct the deficit before a substitute for the flow of liquidity it provided was found. A compromise was reached when it was agreed to work out a contingency plan if it became apparent that more liquidity would be needed.

But the U.S. authorities got the better of the argument as events turned out, not because their logic was better, but because they could not employ effective means of correcting the deficit.

Some hope had been placed in the monetary–fiscal policy mix after the tax reduction was put into effect in 1963-64. The economy accelerated, and the way was cleared for higher interest rates more in keeping with the needs of international equilibrium. But now the push was too far. With mounting defense expenditures due to the Viet Nam war, and aggravated pressure on the capital market, interest rates began to rise past levels tolerable to the Federal Reserve System, which then opened up with an acceleration of monetary expansion, nullifying the external benefits of the policy mix, apparently sacrificing both internal and external objectives as the United States moved from the unemployment-deficit phase to the inflation-deficit phase. Both fiscal and monetary restraint were now in order.

But there were other factors involved. The U.S. deficit has its counterpart in foreign surpluses. Foreign countries, with the possible exception of Germany, *wanted* surpluses and pursued policies to obtain them. As long as their policies succeeded, the United States could not correct the balance-of-payments deficit no matter what actions were taken. If U.S. monetary policy tightened, foreign monetary policies would tighten to protect their surpluses. It was becoming increasingly clear that the effect of U.S. monetary policy was *not* to correct the U.S. balance of payments, but to affect monetary policy all over the world.

Shades of the sterling standard! Recent studies had recognized that the credit policy of the Bank of England in the nineteenth century did not operate as the Cunliffe Committee report asserted it would, and that it was not a matter of deflating when there was a deficit and inflating when there was a surplus. Gold flows were rather directed toward Britain when there was a boom and away from Britain when there was a recession; and the policy of the Bank of England exerted its influence primarily on the money markets throughout the world. The new view of the nineteenth-century gold standard is that it was a system dominated by sterling and that domination was essential to the smooth operation of the system.

The New View of the System

This reinterpretation was of enormous importance, for if it applied to Britain in the nineteenth century, why should it not apply to the United States, the country that had replaced Britain as the center of the system, in the post-1945 system? If true, it meant that American financial policy, instead of worrying about its gold stock or its balance of payments, over which *other countries* have primary control, should be addressed to the need for noninflationary, nonrecessive pressures in the world as a whole. The world, or at least the Atlantic countries, should be looked at as a single monetary system, and the U.S. Federal Reserve authorities should, in short, act as if the Federal Reserve were the world central bank that it was in fact becoming.

The U.S. deficit then acquired a quite different interpretation. It is not something to be corrected; it is rather a variable that determines the rate of expansion of foreign-held world money. Dollars are the world money, and they are held both by U.S. residents and by foreigners. The dollar supply then should be increased or reduced according to whether it is desirable to introduce monetary ease or tightness in the world economy. The deficit is merely that part of U.S. monetary expansion that the rest of the world uses to add to its reserves.

How large the deficit is is not within the control of the United States. The U.S. authorities determine the rate at which monetary liabilities of the Federal Reserve expand, but not that fraction of it that is taken up by central banks and commercial banks in the rest of the world.

Let us check this interpretation against the facts to see to what extent the United States was fulfilling the duties thrust upon her. In 1966 the world economy was inflating excessively. The Federal Reserve stepped on the brakes and reduced the rate of expansion of world money.

By December 1966, weaknesses had appeared in the world economy, and the Fed reversed its tight money policy. This reversal, although harmful to the U.S. balance of payments, was needed because the three largest economies, the United States, the United Kingdom, and Germany, showed signs of recessive tendencies, and France, whose current account balance had become unfavorable, was beginning to contract. Monetary ease was, therefore, the appropriate policy for the world economy and the Federal Reserve authorities "obliged." The system, by 1967, was now beginning, perhaps for the first time, to work well, looking at it in this new light. The Federal Reserve authorities showed signs, by their actions if not their words, that they were reacting to the signals.

For the monetary mechanism can, indeed, be looked on as an information system, supplying signals for policies. The signals from abroad came from the gold conversions. When a European country converts dollars into gold, it is telling the United States, "It is in our interest if you contract." And when it converts gold into dollars, as France did last month, it is saying, "It is in our interest if you expand."

Of course, central bankers have not exactly looked upon the system in just this way. Their gold-dollar policies may appear to be motivated by entirely different considerations. Each central bank may be acting in its own selfish interest, while still fulfilling the hidden designs of the world system. These designs are, of course, not so hard to see as Adam Smith's invisible hand; they are more like Ariadne's thread!

What concerns us, however, is the transition from one system to another and the subtle revision of thinking about world monetary policy in the transition phase.

With hardly anybody noticing it, the gold exchange standard in its old form was dead, and the dollar exchange standard had taken its place. All this occurred perhaps years before the formal breakdown of the old system. It was during 1966-67 that the Federal Reserve System completed a full cycle of tight money and easy money consistent with the requirements of the world economy.

I have now told you why I think that the system evolved as it did into a dollar-exchange standard, a system in which the United States took on a new role and began to adapt its policies to the role of world banker, not just as a key currency center, not just as the provider of a reserve money and the intervention currency, but as a world banker in the more comprehensive sense of guiding the monetary policy of the world.

The French Attack

It is in this light, I submit, that we have to see the devaluation of the pound, the abandonment of the private gold market, and the situation we now face. More particularly, it is in this light that we have to see the awkward and apparently intransigent policies of the French government.

France was responsible, in part, for the weakness of sterling and the run on gold in February and March of this year. It is my view that these policies were not the consequence of French ignorance of the way the system had begun to work; it was rather that the French authorities understood it before anyone else! They anticipated what was going to happen, didn't like what they saw, and attempted to change it.

Every economic system evolves to create a dominant money asset. Concede me the point if you will, although I could easily develop the theoretical case for it if I had more time. Then it is clear that for the French to resist the evolution to a dollar standard, they have to find an alternative. A common European currency was not yet in existence, so gold was the only contender, and so it was to gold that the French government had to turn. If the wings of the dollar were to be clipped, it was necessary to build up gold. That was the intention of M. Giscard d'Estaing when he was Minister of Finance, and his policy was backed by de Gaulle and further implemented by d'Estaing's successors.

Now we could go on to develop a plot here. To weaken the dollar, it would at first be convenient to weaken sterling, for the dollar would be hurt by a substantial devaluation of sterling. This is consistent with the open advocacy of sterling devaluation by France in the months preceding November 1967. But I don't want to go too far and attribute entirely malicious motives to the French. There were other reasons besides. I take at its face value the French refusal to come to British aid in 1966 and 1967, at a time when the other members of the Group of Ten were helping sterling. The French were right. Further assistance to Britain was not only not in the Continent's interest, it was not even in the British interest. The British merely piled up more debts and had to devalue anyway. The French were right on this point, and the other members of the Group of Ten were wrong. This much, I believe, should be frankly conceded.

The British devaluation, if it should have been contemplated at all, was insufficient. From the point of view of the trade balance, it was more than adequate; but it did not make the necessary allowance for the confidence factor when a reserve currency devalues. Because it was insufficient to restore confidence, it weakened sterling as a reserve currency without restoring equilibrium in the British balance of payments. The British devaluation was (*a*) more than adequate from the standpoint of improving the flow of the U.K. balance of trade, (*b*) grossly inadequate from the standpoint of restoring confidence in sterling, but (*c*) just right from the standpoint of a straddling action that would be consistent with preserving the strength of the dollar.

But the French did achieve their aim of weakening sterling as a reserve currency.

The next step was to weaken the dollar by strengthening gold.

In the gold crisis of March 1968, there was considerable speculation that the United States might close off supplies to the London market and might even raise the price of gold. (This would involve the clause in the Fund dealing with a uniform reduction in the par value of all currencies. For the United States to consent requires an act of Congress, but it is not out of the question that Congress could act quickly if it were pressed to do so.)

But the gold forces underestimated the resolve of the U.S. Treasury and the other members of the Group of Ten to hold the official price. They adopted Governor Carli's plan for a two-tier system. The crucial provisions of this plan are that the central banks would not buy nor sell gold in the private market. (It is hoped that, at the IMF governors' meeting next month, this agreement will be generalized beyond those countries that signed the Washington communiqué.)

When we look at events in this way, we arrive at a somewhat different interpretation of the sterling and gold crises. The formal breakdown of the system was not the important thing. It merely recognized fundamental changes that had already taken place. It was a palace insurrection. The revolution had already been won. The system would not collapse with the increase in the price of gold because it had already evolved into a new system over a year earlier. Fear of the consequences of the change in the gold market for the system were misplaced. For now, in August 1968, the cards are on the table for all to see. An ounce of gold is worth about $40 in the private market—provided that South African supplies are kept away from the market. Everybody knows that the price will go down when South African sales are resumed in full force, bearing in mind that there are perhaps about 18,000 tons of gold in liquid hoards in private hands. What holds the price where it is is the gamble that the monetary authorities may yet raise the price; hope springs eternal.

Where We Now Stand

The monetary facts, however, are that the world has virtually moved onto a dollar standard. Of course the United States may claim that it buys and sells gold freely; but everybody knows that it does not. The dollar has become effectively inconvertible into gold, even for foreign central banks. All the big central banks know that if they try to cash dollars for gold in large amounts, the United States will simply stop selling it.

This means that other countries have to hold dollars or adjust. Their only alternative is to eliminate their balance-of-payments surpluses. But if they want surpluses because they want their external reserves to grow, they have to hold dollars or a new international asset.

One might ask, however, Does not the higher price of gold symbolize the weakness of the dollar, rather than its strength?

The answer is a paradoxical one: Yes, but weakness is an essential attribute of an international money.

Gresham's Law states that bad money drives out good—if they both exchange for the same price. If gold is worth more as a commodity than as a money, it will not be used as a money.

If a central banker knew that he could always get $40 for an ounce of gold, he would never settle a monetary transaction with gold valued in official stocks at $35 an ounce. This means that if gold were always worth at least $40 as a commodity, central bank holdings would become completely illiquid. To the extent that this is true—to the extent that gold on private markets *is* worth $40—gold would cease to be an international monetary reserve. Usable reserve assets of the gold-holding central banks would be reduced to the dollar component of reserves.

It is on this basis that the two-tier system should *increase* the demand for dollars, which, to the extent that dollars are softer than gold, become the only usable reserve asset, as well as the only important international currency. The rise in the price of gold in the private market illiquifies or "demonetizes" it.

Now in fact this is an exaggeration. Gold is not really worth $40 as a commodity. Every central banker knows that if he dumps gold onto the private market to get dollars, the pride will go down—and fast. So the argument that I am making is only partly true. Some central banks will sell gold to others at $35 an ounce, as France has been forced to do. To this extent, gold has not been completely demonetized.

The Future

Our system has now evolved, therefore, into a dollar standard, for good or bad. This system has some great advantages, but I would not want to claim that it is an ideal system, nor that it is permanent. Indeed, there are strong objections to it, from an international point of view, on both political and social grounds. Even in the United States there are objections to the system. Some of these objections are very strong indeed. But the question lies with alternatives. There are very few open.

Let me close by listing some of the major alternatives. I believe the basic ones to be (*a*) adoption of the gold standard, (*b*) introduction of a system of flexible exchange rates, (*c*) a return to the gold exchange standard by raising the price of gold, (*d*) a new world currency.

A discussion of the merits of these systems lies far beyond my theme today. Let it suffice for me to say that I do not regard *a* or *b* as feasible, and although *c* is intellectually respectable and institutionally stable, it is very expensive. The plan for a new world currency on the other hand is no longer far-fetched. It is more practical than the alternatives, and I consider it within our grasp, perhaps within the next decade or even sooner.

Agricultural Policy in an Urban Society

Karl A. Fox

DURING the past four years some leading members of this association have expressed a profound malaise concerning the institutional setting in which agricultural policies must now be made. This malaise is justified. Cochrane predicted in 1964 that "increased agricultural productivity is going to drive farm program costs, under voluntary control programs, into direct collision with the budget limitation objectives of the urban voter within the next three to ten years. A crisis in commercial farm policy is in the making" [8, p. 460]. Bonnen, in 1965, concluded that the whole complex of institutions constituting (in his words) the Agricultural Establishment is in danger of imminent demise:

> If the Agricultural Establishment cannot develop the leadership that is capable of seeing the situation as it really is and adjusting to it, then it not only will fail to survive in any meaningful form but will deserve its death. And the headstone erected by an urban society will read:
>
> THE AGRICULTURAL ESTABLISHMENT OF THE UNITED STATES:
> ITS PROMISE EXCEEDED ITS PERFORMANCE,
> AND FALLING INTO SOCIAL IRRELEVANCE
> IT TOOK ITS OWN USELESS LIFE.
> R. I. P. [7, p. 1129]

But we do not sin alone. The various nonagricultural Establishments are not doing well either. The "collision course" prophecy applies with equal strength to the financing of foreign aid. The war in Vietnam is a source of moral revulsion to many young people and the draft is a source of major uncertainties and delays in planning for education, jobs, and marriage. White activists in a number of universities are challenging the distribution of power and resources on the campus. Black activists are challenging what they regard as a racist society. Our largest cities face a staggering array of problems. Even without the Vietnam war, our perception of the task of shaping a nonexplosive world order seems to call for a huge national defense budget.

In this context, it is hard to elicit much sympathy for the price and income problems of commercial farmers. Holding the present line is all that might be expected and is, indeed, about all that President Johnson has requested in 1968. "Rural poverty" has somewhat more claim to attention, but it is less concentrated, less visible, and less explosive than the black ghetto. Thus, to the extent that we are caught up in what Bonnen calls

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Karl A. Fox *is distinguished professor in sciences and humanities and head of the Department of Economics at Iowa State University.*

the Agricultural Establishment, we are left with policy problems which are of peripheral interest to the larger society.

Just a year ago, Bishop gave us an exhortation and a warning in terms of the two major subdivisions of our traditions as agricultural economists:

> As the urban process penetrates deeper into rural America, we must show more concern about the effectiveness with which social, political, and economic institutions meet the needs of people in rural areas. . . . To continue on the road we have been traveling will likely lead us into the role of publicly subsidized consultants to the corporate farms and marketing firms of the future [6, pp. 1005, 1007].

Our capacity to analyze problems of farms and agribusiness firms is substantial and it is rapidly increasing. We can continue to contribute to the productivity of agriculture and agribusiness at home and in the less-developed countries, and this—both at home and abroad—is a thoroughly respectable calling.

The difficulty we encounter in trying to serve the community is by far the greatest source of frustration for many of us in the Agricultural Establishment at present. It is here we feel that we not only have failed to meet the needs of the present but also have fallen from former glory.

The Tradition of Community Service in Agricultural Economics

The objective of serving the rural community was present at the very birth of agricultural economics and of our association. The story is told in detail by Henry and Anne Taylor [22, pp. 90–96]. They give a great deal of credit to Thomas F. Hunt, as chairman of a 1911 Committee on Instruction in Agriculture [23], for establishing a broad definition of the scope of "rural economics" in the land-grant colleges. The Committee's report read in part as follows:

> It seems desirable to use the term *rural economics* as applicable to the general field of economics in its relation to agriculture and rural communities. . . .
>
> Rural economics is preferable to agricultural economics because the former term indicates that the affairs of the community, as well as of the individual farmer, are to be considered under this head. . . .
>
> Your committee is deeply impressed with the importance of developing strong courses in rural economics and sociology and the other subjects just referred to.[1] . . . These all involve the human element in agriculture and country life. They tend to raise the college courses in agriculture above the materialistic plane, to emphasize broadly the human interest that properly inheres in agricultural studies, and thus to inspire both faculties and students in our agricultural colleges with a higher sense of the wide responsibilities attaching to leadership in agricultural affairs. Pedagogically, they serve to show that agriculture, when broadly treated, is to be enrolled among the humanities, as well as the sciences; ethically,

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[1] Rural law and legislation, history of agriculture, and comparative agriculture.

they point out the vital connection between agricultural science and the welfare of rural people and even of all mankind [23, pp. 13–14].

Hunt defined farm management as "that phase of rural economics which deals with the business organization and direction of individual farm enterprises" [23, pp. 13–14]. Farm management was a part, but only a part, of the rural economist's domain. Henry Taylor agreed wholeheartedly with Hunt's broad view of rural economics as of 1911, and in fact dedicated his *Story of Agricultural Economics* (1952) "To Thomas Forsythe Hunt, who opened the door for agricultural economics in the land-grant colleges" [22, dedication page].

While Hunt and Taylor were growing up, the proportion of our total population living in "rural territory" (including those on farms) ranged from four-fifths to two-thirds. Service to the rural community meant service to a sizable majority of the people of the United States. Even in 1910, some 55 percent of our total population lived in "rural territory"—35 percent on farms and 20 percent in towns, villages, and hamlets of less than 2,500 people. The obvious importance of rural economics drew into this field some extraordinarily capable men with broad training and broad interests. In the 1890's the German universities were regarded as the best in the world, and Henry Taylor went to Germany for part of his graduate work. John D. Black, E. G. Nourse, and Joseph S. Davis became presidents of the American Economic Association as well as of the AFEA. In any generation, men of this caliber would go "where the action is," and there was action in agricultural economics and policy.

Today, only 5 percent of our total population is living on farms and the rural community has ceased to exist as a separate and definable entity. Can we nevertheless translate the intent and spirit of Hunt's 1911 statement into a program for the present that will challenge social scientists of the caliber of Taylor, Black, Davis, and Nourse? A clue may be found in the origins of the rural community in the United States and the manner of its disappearance.

The Genesis of Rural Communities in the United States

Agricultural settlement and land speculation commanded the drive and enthusiasm of all but a handful of the most capable people west of the Alleghenies from the end of the American Revolution right up to the Civil War. Johnstone speaks of the "boomer psychology" of the settlers, which was justified by "the everyday experience of a people feverishly colonizing the rich and unexploited continent in an age of unprecedented world-wide commercial expansion" [18, pp. 129–130].

In 1817, Birkbeck was impressed by the sensational rises in land values in Ohio ("an advance of a thousand percent, in about 10 years!") and by the way towns sprang up out of the wilderness in Indiana and Illinois:

> On any spot where a few settlers cluster together . . . some enterprising proprietor finds in his section what he deems a good scite (*sic*) for a town; he has it surveyed and laid out in lots, which he sells, or offers for sale by auction.
>
> The new town then assumes the name of its founder:—a storekeeper builds a little framed store, and sends for a few cases of goods; and then a tavern starts up, which becomes the residence of a doctor and of a lawyer, and the boarding house of the store keeper. . . . Soon follow a blacksmith and other handicraftsmen in useful succession: a schoolmaster, who is also the minister of religion, becomes an important accession to this rising community. Thus the town proceeds, if it proceeds at all, with accumulating force, until it becomes the metropolis of the neighborhood. Hundreds of these speculations may have failed, but hundreds prosper; and thus trade begins and thrives, as population grows around these lucky spots, imports and exports maintaining their just proportion. One year ago, the neighborhood of this very town of Princeton was clad in buckskin; now the men appear at church in good blue cloth, and the women in fine calicoes and straw bonnets [4, p. 85].

Here we see the process of agricultural settlement and the emergence of villages in an intimate pattern of social and economic interdependence with the farm people at its very beginning.

The Mature Agricultural Community Toward the End of the Horse-and-Buggy Era

A century later (1915) Galpin published his classic study, *The Social Anatomy of an Agricultural Community*, based on an intensive survey of trade areas and other spatial patterns in Walworth County, Wisconsin. He delineated 12 trade areas covering, on the average, about 50 square miles each, and described "the actual but unofficial community" as follows:

> Eight of the twelve civic centers of Walworth Country are incorporated; four as cities and four as villages. Officially, that is legally, the incorporated centers are treated as communities, each by and for itself. The foregoing analysis of the use of the leading institutions of each center by the farm population discloses the fact, however, that these institutions are agencies of social service over a comparatively determinable and fixed area of land surrounding each center; that this social service is precisely the same in character as is rendered to those people—whether artisans, employees, or professional persons—who happen to live within the corporate limits of the city or village; moreover, the plain inference is that the inhabitants of the center are more vitally concerned in reality with the development and upkeep of their particular farm land basis than with any other equal area of land in the state.
>
> It is difficult, if not impossible, to avoid the conclusion that the trade zone about one of these rather complete agricultural civic centers forms the boundary of an actual, if not legal, community, within which the apparent entanglement of human life is resolved into a fairly unitary system of interrelatedness. The fundamental community is a composite

> of many expanding and contracting feature communities possessing the characteristic pulsating instability of all real life. . . .
>
> It is possible to conventionalize the form and relationships of these twelve agricultural communities in the following way. Suppose the civic centers to be equal in size and population, equally complete institutionally, and equally distant from each other; suppose all farm homes to be connected with the centers by equally good roads at all seasons of the year, and also equally direct. Then apparently each community would be a circle, with the agricultural city as its center, having a radius somewhat longer than half the distance between any two centers. In order to include all the farm territory within some circle, and to have the least possible common areas, we must impose the further condition that the centers be arranged so that only six centers are equally distant from any one center [16, pp. 16–19].

The important points in the observations of Galpin and Birkbeck are (1) the relative completeness and self-containment of each community with respect to its residentiary activities (retail trade, schools, churches, medical and legal services, and the like, (2) the close interdependence of persons living on farms and persons living in the village center, (3) the identical nature of the services provided by institutions in the village center to persons living on farms and persons living in the village center, and (4) the assumption that only one basic kind and size of agricultural community needed to be considered.

The Automotive Revolution and the Emergence of Functional Economic Areas

When Galpin began his survey in 1911, there were about 600,000 passenger automobiles in the United States. As of 1968 there are more than 60 million—an increase of at least a hundredfold! There is conclusive evidence that the United States can be delineated into a set of functional economic areas or commuting fields in terms of the patterns of home-to-work commuting from the peripheries of such areas to the cities of (usually) 25,000 or more population at their centers. The speed of travel is ten times as fast as in Galpin's day; consequently, the radius of the fundamental community of 1968 is about 50 miles (instead of 5) and its area is about 5,000 square miles (instead of 50). Galpin's communities included 2,000 to 4,000 people; the functional economic areas of 1968 include from 100,000 to 200,000 or more people. Various terms have been used to describe the nature of these functional economic areas, including *urban fields, commuting fields, labor market areas, urban community-of-interest areas,* and *low-density cities.* The functional economic area has also been referred to as "a new synthesis of rural and urban society" [10].

It will be useful to characterize the change from 1911 to 1968 in terms of a hierarchy of central places. "Central places" are usually taken to be towns and cities, but the same concepts can be applied to the locational patterns of shopping centers within the larger cities.

Berry and Harris state, as of 1968: "Most students suggest that the urban hierarchy has eight levels in advanced Western economies, roughly: the national capital; national metropolitan centers; regional metropolitan centers; regional capitals; small cities (e.g., county seats); towns; villages; and hamlets" [3, p. 368].

In the United States, I have stressed a particular level in this hierarchy for purposes of economic analysis and policy in the 1960's and 1970's, that is, the regional capital. The hamlets and villages are relics of the previously existing horse-and-buggy society; they have lost the bulk of their earlier consumer-oriented activities. The almost universal ownership of passenger automobiles has shaped the towns, small cities, and regional capitals into a three-level central-place hierarchy. The area integrated around the regional capital is the home-to-work commuting field, the size of which is dictated (for the most part) by travel times in passenger automobiles.

Galpin's agricultural community was centered on a village; its modern counterpart is centered on a regional capital, three steps farther up in the Berry and Harris urban hierarchy. The four important points which applied to Galpin's community apply also to its modern counterpart, with only slight paraphrasing and modification.

Berry [2], using all of the home-to-work commuting data in the 1960 Census, has recently delineated 358 clusters of counties which (following my terminology) he calls *functional economic areas* (FEA's). Some 96 percent of the total United States population in 1960 lived within the boundaries of these FEA's. Thus, the FEA serves as a frame of reference for 96 percent of all labor market activity (probably 97 percent by 1970) and for nearly 100 percent of retail trade and service activities, which normally require direct contact with consumers, citizens, taxpayers, students, patients, etc.

Broadly speaking, an FEA may be regarded as a "macro-household" which is essentially self-contained with respect to residentiary activities that account (as of 1968) for about 60 percent of total employment. The remaining employment (on the order of 40 percent) in each FEA is part of an interarea trading system. The "export-oriented" activities include agriculture, most manufacturing, most mining and forestry, tourist attractions, state universities, state capitals, and many other private and public establishments which, though located in one FEA, are designed to serve residents of several or many FEA's.

The regional capitals about which FEA's are centered play strategic roles in the national system of cities. They are the basic points of articulation which link all of the FEA's into a truly national economic system.

Functional Economic Areas as Subareas or Basic Communities Within a Metropolis

Time and space are running short, so I will state a number of propositions without proof:

1. The distribution of shopping centers in metropolitan areas forms a three-stage hierarchy consisting of *regional, district,* and *neighborhood* centers. Let us call these R, D, and N-level centers respectively. The shopping facilities of the regional centers are in most respects as complete as those of the central business district.
2. In nonmetropolitan FEA's, the same three-stage hierarchy is found in the shopping facilities of the regional capital, the small cities, and the towns, respectively.
3. In terms of *minutes,* including delays at traffic lights, parking lots, and the like, the effective "distances" between shopping centers of any given level in the metropolis are not much less than those between shopping centers of the same hierarchical level in nonmetropolitan FEA's.
4. In nonmetropolitan FEA's, the R-level trade area tends to coincide with the commuting field, forming what I have called a mononuclear FEA [12]. A large metropolis is equivalent to the close-packing of several or many mononuclear FEA's; the residentiary activities of these FEA's are largely contained within the trade areas of R-level shopping centers, but the locations of export base employment for the residents of any given R-level trade area are scrambled and distorted by freeways and rapid transit systems.
5. The same principles of human ecology and central-place theory appear to explain the replacement of rural communities by mononuclear FEA's and also to provide a basis for reshaping our metropolitan areas into clusters of semi-independent communities of the FEA type and population size.

Galpin conceptualized the "fundamental community" of 1911 as one (implicitly) containing about 2,000 to 4,000 people. The "fundamental community" of 1968 contains about 100,000 to 500,000 people. If we want to serve the community in addition to serving commercial agriculture, we must learn to work with communities of the size indicated. These communities include farm and nonfarm residents, indiscriminately.

Policy Implications of the New Spatial Organization of the United States

To oversimplify, we might say that the central object of domestic economic policy in the United States should be to maintain continuous full employment in each of the approximately 500 FEA's and metropolitan subareas into which the country is now subdivided. This provides one kind of challenge to programs which operate on a county or subcounty basis (that is, with units only a fraction as large as an FEA). It provides another kind of challenge to our traditional macroeconomic stabilization policies, which use monolithic national instruments and measure their success in terms of national averages and aggregates. In designing programs to help particular counties or towns, we think too small; in designing programs to stabilize national average employment and prices, we think too large.

To give a rough idea of the challenges implied to our existing policy-making Establishments by the new spatial organization of the United States, let me quote from a paper which I wrote and circulated about four months ago (April 29, 1968):

> Recent events have focused public attention on problems of race relations which are intertwined with poverty, unemployment, alienation and rioting in the urban ghettos. Though these problems find their most acute and alarming expressions in our largest cities, their causes are nation-wide in scope. Hence, their solutions must also be framed in a nation-wide perspective.
>
> Two problems which have been very widely discussed I will mention only briefly. This will clear the way for focusing our attention on a cluster of five other, mutually interrelated, problems which are not so well understood. These are:
>
> 1. The depersonalization of human relationships and the breakdown of effective community life in our large cities;
> 2. The fragmentation of our rural areas into thousands of counties and innumerable small towns, each of which is too small to exert any significant control over its economic destiny;
> 3. The lack of expanding job opportunities in many of our rural areas, which forces potential young workers and community leaders to migrate over long distances to secure employment and establish homes in distant cities;
> 4. The shortage of job opportunities for many residents of our largest metropolitan areas; and
> 5. The extremely high national average level of unemployment in the United States (typically 3.5 percent or more of the labor force), whereas some of the smaller European democracies are able to maintain unemployment rates of one percent or less.
>
> While each of these problems is partly separable from the others, they form an interrelated cluster which can best be solved by using an appropriate set of programs and policies in a coordinated way [11].

(The basic principles for dealing with sets of economic policies are presented in Fox, Sengupta, and Thorbecke [15]).

The problem of abject poverty wherever it exists, in both urban and rural areas, can best be attacked by means of a guaranteed income plan. To save space, I will not comment here on the problem of metropolitan congestion and air pollution. The main elements of my proposal for dealing with the five other interrelated problems are as follows:

1. Our metropolitan areas should be restructured to establish civic responsibility within logically delineated subareas of not more than 500,000

residents each. Planning and redevelopment should be designed to establish and reinforce a sense of community within each subarea.

Once a subarea of this sort has been delineated, the objective of physical, economic, and social planning should be to develop it into an independent or semi-independent well-balanced community with municipal or quasi-municipal government powers. A geographic, physical, and governmental framework should be established for focusing community concern, for enhancing human dignity, and for improving the quality of the environment within its boundaries.

The establishment of a viable subarea along these lines would also provide a frame within which churches and other institutions could conduct effective programs to promote the welfare of a definite, geographically bounded community, including all of its residents regardless of race, native language, or current economic status.

2. Nonmetropolitan America with its 3,000 counties and 18,000 incorporated places has been gathered *de facto* into about 350 multicounty functional economic areas (urban-centered commuting fields), most of which contain essentially full lines of consumer goods and services.

Multicounty functional areas with populations of 250,000 or more should have approximately the same range and quality of community leadership and professional talent as might be found or developed in the metropolitan subareas already mentioned. Some of the less populous functional areas should be planfully developed to achieve populations of 250,000 or more.

The cohesiveness of multicounty functional areas should be enhanced and their capacity for civic responsibility recognized and further developed. Churches and other institutions can reinforce the sense of community in such areas and direct their efforts toward the well-being of all persons residing within their boundaries. (See, for example, Bell and others, *Ecumenical Designs* [1]).

3. The United States, then, should be viewed as consisting of approximately 500 semi-independent communities, some of which are physically embedded in, or on the edges of, metropolitan complexes and some of which extend over several contiguous counties containing large stretches of farmland and open country.

We suggest that about 150 of these 500 areas, scattered throughout the United States, should be planned, redeveloped, and expanded so rapidly as to generate construction booms and local labor shortages. About 50 of these development areas would be selected in metropolises of a million or more people, and 75 or more would be multicounty functional areas. State governors would have major responsibility for designating which areas in their states would be selected for rapid redevelopment and/or population growth. This approach would channel the so-called new towns movement into a fundamental and significant role consistent with the existing spatial economic organization of the United States.

4. These 150 or so construction booms would provide a means for achieving maximum employment in at least 150 areas and probably more. Employers in each of the construction boom areas would presumably try to recruit additional workers from nearby functional economic areas or nearby sectors of the metropolis, and state and local labor services could doubtless be organized to facilitate these relatively short-distance moves.

Given the planned areas of continuing labor shortage, both public and private employers operating in multiple locations could get on with the job of transferring qualified personnel internally and with perfect job security into the areas of labor shortage, backed up by recruiting and on-the-job training in the major metropolitan centers.

5. The capacity of this set of policy instruments (150 planned growth centers plus programs for interarea labor transfers) should make it possible to approximate full employment in every labor market area without generating a cumulative wage and price inflation. In effect, interarea labor transfers would be used to implement specific high employment goals in all labor markets. If the result was to "overheat" the national economy as a whole, the traditional nationwide instruments, such as income surtaxes, excise taxes, and tightening of the money supply, could be used, relying upon labor market transactions to avert serious or protracted unemployment in any individual area.

The Spatial Disorientation of Existing Establishments

Bonnen spoke in 1965 of a massive failure of leadership in the Agricultural Establishment. For the moment, there is a massive failure of leadership in the entire complex of Establishments concerned with economic and social policy and action. If every such Establishment were, in Bonnen's metaphor, to take "its own useless life" [7, p. 1129], the headstone of the Agricultural Establishment would be observable but not conspicuous.

Each Establishment is the product of independent improvisation and "disjointed incrementalism." To quote Copernicus (from another context), their development "has been as if someone were to collect hands, feet, a head, and other members from various places, all very fine in themselves, but not proportionate to one body, and no single one corresponding in its turn to the others, so that a monster rather than a man would be the result. . . . This certainly would not have happened to them if they had followed fixed principles; for if the hypotheses they assumed were not false, all that resulted therefrom would be verified indubitably" [9].

Collectively, our Establishments reflect horrendous misconceptions concerning the present structure of the United States economy and society.

Until some of these misconceptions are dispelled, we cannot hope for major improvements in economic and social policies, agricultural or other, and we will have no basis for revamping institutional structures.

The Need for Symmetrical Treatment of Economic and Noneconomic Goals

One of our problems in helping people will be to deal simultaneously and symmetrically with economic and noneconomic needs and goals. For example, in a very recent paper, Bishop states: "If we are to meet the needs of the poor, we must decide what these needs are. It is frequently stated that the poor want 'food in their stomachs, clothing on their backs and a roof over their heads!' But I believe that the poor have four more basic wants. First, and perhaps foremost, they want personal respect" [5]. The other three needs listed by Bishop are social justice, economic opportunity and "a political voice. They desire to help determine their own destiny" [5].

Unfortunately, the individual social sciences have developed independently by their own processes of "disjointed incrementalism"; collectively, they too form a Copernican monster in terms of (1) lack of congruity at the conceptual level, (2) lack of additivity or complementarity in problem-oriented research, and (3) lack of integration in curricula at the primary, secondary, college, and graduate levels.

However, many individual scholars are beginning to recognize both the need and the feasibility of developing a comprehensive social science—"a science of man." The new *International Encyclopedia of the Social Sciences* [17], published just four or five months ago, provides a vast new resource for breaking down the feudal fragmentation of knowledge and instruction which now prevails.

In his Encyclopedia article on social systems, Talcott Parsons [20] speaks of "generalized media of exchange" which include (1) money, (2) political power, (3) prestige or influence, (4) affect, recognition, and response, (5) reputation, and (6) generalized commitments to the implementation of cultural values. (I believe that this is one of the most important things we expect of a President.) He also lists ideology, conscience, and faith in somewhat special connotations. Each "medium of exchange" can also be expressed as a goal; that is, Parsons and Bishop are talking about the same human values and aspirations.

The backlog of conceptual progress embodied in this encyclopedia and in the recent journal and monograph literature of the social sciences is impressive. The "state of the arts" will, I believe, permit us to make rapid progress toward the following:

1. Extending consumption theory (in ordinal form) to include the relevant noneconomic goals of individuals.

2. Estimating marginal "exchange rates" for a given individual between these various goals or media of exchange.
3. Estimating the equivalent of "market demand functions" for groups of individuals in terms of all the relevant goals or media of exchange (crudely, no doubt, at first).
4. Extending this approach to derive estimates of Gross Social Product, which will include noneconomic types of income (in dollar equivalents, using a matrix of exchange rates between time and the various media).
5. Giving symmetrical treatment to the outputs of all market and nonmarket institutions, including universities, government agencies, and their various subdividions. (Some applications of activity analysis models to university departments and colleges, using cardinal objective functions, have been made [14, 19]).

All these things are possible, in my opinion, and are in fact necessary if agricultural economists and social scientists generally are to contribute decisively to the solution of the major social problems which confront us in the United States.[2]

Need for a Quantum Jump in Scientific Understanding and Design of Social and Economic Policies Affecting Farm and Nonfarm People

In the 1920's, agricultural economists built up a backlog of research methodology and empirical results. In the early 1930's, the Great Depression confronted all then-existing Establishments with a major emergency. In comparison with farm legislation passed in the 1920's, for example, the Agricultural Adjustment Act of 1933 represented a quantum jump in program design. Its objectives were clearly stated and the means provided were well adapted to these ends. It contained most of the features which are now embodied in the Food and Agriculture Act of 1965. The 1933 Act reflects the handiwork of some outstanding economists who had themselves contributed to the backlog of relevant research.

During the 1950's and 1960's, agricultural economists, general economists, urban and regional economists, quantitative geographers, and other social scientists have built up another impressive backlog of methodology and empirical results. USDA's capacity to analyze alternative farm programs was well described by Cochrane in his December 1964 paper. Recent issues of our association's journal reflect a high level of sophistication.

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[2] See the following articles and the references cited therein: Fox [13] and Sengupta and Fox [21]. See especially, in the latter, Chapter 7, "Models of Resource Allocation and Planning in Educational Institutions and Systems," and portions of Chapter 9 on behavior settings, social systems, roles, rewards and contributions, optimal allocation of time among behavior-setting and role combinations, and adaptation of Talcott Parsons' concept of "generalized media of exchange" to an extension of consumption theory and a matrix of (marginal) exchange rates among multiple economic and noneconomic goals. The increase in speed of local transportation from horse-and-buggy to automobile can be treated as a change in the exchange rate of *time* for *distance;* hence, in principle, changes in the average speed of personal travel in any community can be introduced into an exchange rate matrix involving multiple media and the corresponding goals. The concept of "vector reapportionment" is used to characterize the successive readjustments of economic, political, educational, and religious institutions to the change in size of the basic human community from an agricultural village to a modern functional economic area (FEA).

The problems which confront us in 1968 are just as challenging to our skills as social scientists as were the problems of 1933. What is needed is a quantum jump in the way in which we organize and apply our existing knowledge and develop the conceptual frameworks and models needed for policy design in a general social system. We must understand these models clearly enough ourselves so that we can explain them to those who exercise political power and other forms of influence.

Such a quantum jump would no doubt modify a great many working relationships within and between existing Establishments and their subdivisions. Institutional arrangements must be devised which will enable us to step outside of the feudal principalities which have grown up within universities and within public agencies and deal with social and scientific problems in the form and on the scale in which they present themselves today.

If we and our political and administrative leaders can rise to this challenge, the future of the Agricultural Establishment and all other Establishments involved in social and economic policy will be, not a suicide (as Bonnen feared), but simply a much-needed and highly promising metamorphosis.

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PLANNING INVESTMENTS IN RESEARCH AND EDUCATION

CHAIRMAN: B. F. STANTON, CORNELL UNIVERSITY

Evaluation and Planning of Research in the Experiment Station*

ARNOLD PAULSEN AND DONALD R. KALDOR

IF research is viewed as a social investment, the criterion for selecting specific research investment is the greatest social return possible for total investment funds available. The criterion is implemented by estimating the expected rate of return for resources to be used in each alternative and selecting enough of those research investment alternatives with the most favorable benefits relative to costs to utilize the available budget. But difficulties are encountered (1) in getting acceptance of the view that research is a social investment, (2) in specifying the substance of social return, (3) in estimating the expected rate of social return, and (4) in implementing the resulting research investment plan.

Research as a Social Investment

Research, public or private, uses resources that have alternative uses and thus entails opportunity costs to society. For instance, research professors could put more of their time on teaching, either on campus or off, and thereby secure fuller use of already generated knowledge. Except for the satisfaction obtained in the process of doing research, the return to society from new knowledge comes only from use some time after the research expenditure is made. Whether the research is public or private, society collectively foregoes other products as it commits or permits resources to be invested in research. The only justification of such social cost is a large enough future social return to cover current opportunity cost and the inconvenience of waiting.

Although most economists and scientists probably accept the idea that publicly supported research is a social investment, far fewer are willing to accept the implication that social benefit-cost criteria should be applied to *specific* research or salary expenditures by the representatives of society—that is, by administrators.[1] Most agricultural economists accept the

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[1] "Scientists . . . agree that planning of their work would be unwise" [10, p. 7].

ARNOLD PAULSEN AND DONALD R. KALDOR *are professors of economics at Iowa State University.*

generalization that research on agriculture has been a profitable social investment. Several studies have estimated the aggregate return to blocks of research and education expenditures [4, 8]. Only a few economists, however, have used their professional tools to help guide the investment process per se.

Since World War II, the problems of efficient public administration of agricultural research resources have increased rapidly in size and complexity. Each year the agricultural sector seems to have more rather than fewer researchable problems. Specialization in research has grown rapidly and this has increased the need for program planning and coordination. The general explosion of knowledge and the proliferation of funding sources have increased the possible scope or range in the mix of station research activities. There has been a rapid expansion in indirect research on agriculture; that is, there is now much research affecting agriculture that is conducted in scientific disciplines and laboratories not administered by any public agricultural research administrator. Agricultural research and development activity in private industry is now larger than that in the public sector and is growing at a faster pace. Finally, and probably most importantly, the relative social significance of different agricultural problems has changed; that is, the relative prices of different research results have shifted. This has altered the rate of return on alternative research investments.

These and related developments have greatly complicated the task of publicly managing agricultural research.[2] It has become increasingly difficult for society, its representatives, and agricultural research administrators to identify the most valuable allocation of research resources. Awareness of the growing problem of research evaluation and planning is reflected in the 1965-66 study of agricultural research requested by Congress and carried out jointly by the Association of State Universities and Land-Grant Colleges and the United States Department of Agriculture [2]. The need for better solutions to the problem of allocating research investment is reflected in the recent appointment by the experimental station directors in one region after another of a full-time agricultural research coordinator to help them collectively plan a better research program. There are also in the United States many projects and centers focusing on general technology assessment and the effect of science on human affairs [3]. Some experiment station directors are now encouraging research on their individual research management problems. This task is logically one that should involve agricultural economists.

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[2] "In fact, however, the scientists are not unsupervised: they are subject to very strong social controls from the scientific community and it is, therefore, quite safe to leave them free of other supervision" [10, p. 7].

In 1966 the Iowa Station initiated such a study. We were invited to help develop more effective techniques of research evaluation, coordination, and planning. Administrators at the Iowa Station wanted to use a more systematic and consistent method for deciding which research proposals should be undertaken with scarce resources.

The Substance of Social Return from Research

The output of research investment is new knowledge. New knowledge is wanted by the taxpayers, not for its own sake, but for the contribution it is expected to make to other ends [6, 7]. The researcher, of course, may well be as much motivated by intellectual curiosity as by social return.[3] The output of research is valued as an investment of society because goal attainment is enhanced by new knowledge.

The relevant demand for new knowledge and the justification for expenditure on research is expected contribution to attainment of collective goals. New knowledge is a means, not an end. On this basis each research opportunity should be valued in relation to its expected contribution (direct or indirect, immediate or ultimate) to particular social goals. Thus, the evaluation procedure needs to anticipate the linkages between each alternative research expenditure and the ultimate attainment of social goals. Simply put, the accumulated expected cost of each package of new knowledge and its discounted future effect on each significant social goal must be estimated (Table 1). The task is large, expensive, and uncertain. The main task facing economists is to optimize the procedure so as to minimize its cost. It is probably the substance, not the general theory, of this problem that requires the creativity of economists.[4]

In the context of an experiment station, whose goals are relevant to the evaluation of research? Is it the personal goals of the scientist or those of his professional society? Should one use the goals perceived by department heads or those articulated by station administrators? Or should it be the goals of the public that provides the support for research? Who makes up the station's public? And who should articulate this public's goals?

Since there are multiple goals, there is a weighting problem. What is the relative importance of each of the goals of the station's public? Who

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[3] It needs to be recognized in research as in education that knowledge also may have the attributes of a final product (that is, a consumption good). Treating research or education exclusively as an investment good (that is, intermediate product) would tend to undervalue research. This has more significance in deciding the allocation of funds between research and other investments (for example, soil conservation vs. research). When the focus is on different kinds of research investment, the consumption-good aspect of satisfying curiosity can more safely be disregarded.

[4] "Americans are intensely practical, and it is difficult to accept the idea that a result is not best achieved by systematic planning. . . . In fact, surprise in the development of technology is our regular fare" [9, p. 17].

Table 1. Illustration of the set of contributions and weights that must be estimated (lower case) and statistics that must be calculated (upper case) to relate research investment alternatives quantitatively with cost restraints and goals to be maximized and hence permit quantitative planning of an investment program in research

Costs and contributions	Alternative 1	Alternative 2	Alternative n	Total
Dollar cost—C	$C_1 = w_1c_{11} + w_2c_{21}$	$C_2 = w_1c_{12} + w_2c_{22}$	—	$TC = \sum_{j=1}^{n} C_j$
Science man-years	c_{11}	c_{12}	—	
Other man-years	c_{21}	c_{22}	—	
Contribution to growth—G	$G_1 = w_3g_{11} + w_4g_{21}$	$G_2 = w_3g_{12} + w_4g_{22}$	—	$TG = \sum_{j=1}^{n} G_j$
Resources saved	g_{11}	g_{12}	—	
Output increased	g_{21}	g_{22}	—	
Contribution to equity—E	$E_1 = w_5e_{11} + w_6e_{21}$	$E_2 = w_5e_{12}w_6e_{22}$	—	$TE = \sum_{j=1}^{n} E_j$
Absolute equity	e_{11}	e_{12}	—	
Relative equity	e_{21}	e_{22}	—	
Contribution to security—S	$S_1 = w_7s_{11} + w_8s_{21}$	$S_2 = w_7s_{12} + w_8s_{22}$	—	$TS = \sum_{j=1}^{n} S_j$
Security of person	s_{11}	s_{12}	—	
Security of property	s_{21}	s_{22}	—	
Total goal contribution—B	$B_1 = w_9G_1 + w_{10}E_1 + w_{11}S_1$	$B_2 = w_9G_2 + w_{10}E_2 + w_{11}S_2$	—	$TB = \sum_{j=1}^{n} B_j$
Growth–cost ratio	$GC_1 = G_1/C_1$	$GC_2 = G_2/C_2$	—	
Equity–cost ratio	$EC_1 = E_1/C_1$	$EC_2 = E_2/C_2$	—	
Security–cost ratio	$SC_1 = S_1/C_1$	$SC_2 = S_2/C_2$	—	
Total goal–cost ratio	$BC_1 = B_1/C_1$	$BC_2 = B_2/C_2$	—	

should specify the number of units of one goal that will substitute for one unit of another goal?

Moreoever, there are other persistent problems in program evaluation with respect to social goals. Which measure or scale does one use to determine accomplishment of each goal? How does one compare program elements with different degrees of risk and different numbers of years of investment or payoff? The estimation problems are large, which indicates that application of economics to this area is still in its infancy.

In the Iowa study, it was decided, following a series of discussions between college administrators and department heads, that the goals that should guide station research should be those held by the supporting public. This is consistent with public service theory and the practical politics of obtaining experiment station appropriations [7]. The use of social goals for research program planning does not, of course, preclude taking into account personal goals and work preferences of individual scientists and administrators. The cost or availability of professors for a specific research activity will influence the benefit–cost ratio and feasibility of that specific research.

Three broad social goals were selected at Iowa as most relevant to station research. These were designated *growth*, *equity*, and *security*. Briefly, *growth* was defined as increased capacity to satisfy individual and collective wants. In principle, it included both market and nonmarket Gross National Product. Quantitatively, the growth contribution can often be estimated in terms of resources saved in producing a product of equivalent total value. Resources can be saved by research by designing an improved technique or an improved product. *Equity* was defined as a fair or just sharing of those things available to satisfy human wants. Equity, thus, is made up of at least two important, but often conflicting, subgoals: (1) absolute equity, that is, bringing more people up to or above minimum welfare or consumption standards, and (2) relative equity, that is, providing rewards to people more nearly in line with what each "deserves." *Security* was defined as the protection of life, health, personal liberties, income, and property from loss or risk of loss not associated with due process of law.

With the three goals defined, one must then designate which groups of people are to be focused upon as one estimates the expected positive or negative effects of each research alternative on each goal. Since research at an agricultural experiment station is supported largely by state and federal appropriations, it was decided at Iowa to recognize two publics—all the people of the state and all the people of the nation. Evaluations, thus, ideally should be made of each alternative research investment in terms of absolute cost and absolute contribution to state growth, equity, and security goals and to national growth, equity, and security goals.

Estimating the Expected Rate of Social Return from Specific Research Alternatives

It appears that all estimates of future return must be based on past experience. Past investment experience is used by citing historical case examples from the local station or more recently perhaps, by the more econometrically oriented directors, by citing aggregate analysis [4, 8]. It is comforting to the station director and perhaps even persuasive with some legislators to point out that, in certain cases or even on the average, research has been a profitable social investment in the past. This truth is really, however, of very little help to an administrator in selecting and justifying the specific small sample of research investments to be made at a particular station or laboratory. New research proposals are not a random sample from the sample population as past research nor are they repeats of specific case examples.

The profitability of specific research is probably so highly variable that categorizing research by discipline or commodity probably reduces very little the variance in profitability among station research alternatives. Categorizing research is of no help at all in improving the validity of the assumption that, on the average, future research in a category should have a rate of return similar to the average of past returns on investment in that category.

Given this perception of the variability and uniqueness of research alternatives, it seems that there is no logical escape from the necessity of estimating expected costs and returns of specific investment alternatives.[5]

A special research evaluation staff attached to the office of the director might be used to estimate such costs and returns for each specific research alternative. The Iowa procedure, however, involves detailed written instructions to selected teams of scientists that identify and estimate the costs and returns of specific research alternatives. Since the estimates require some knowledge that only scientists working in the area can provide, it seemed best to teach scientists the rudiments of cost-and-return estimation procedure. To estimate costs and returns, the scientists must rather thoroughly design and think through the research idea. This they can do much more creatively than a professional evaluator. The costs-

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[5] The long-range study uses categories of research (research problem areas) as the unit of research evaluation. The Agricultural Research Service of the United States Department of Agriculture planning procedure uses a specific "technology" as the unit to be evaluated. This ARS procedure is parallel with our procedure in evaluating unique research alternatives. Some experiment stations use both categories and specific alternatives. They allocate funds to departments (categories), which in turn allocate to individuals (subcategories). However, the station may also require, review, and disapprove specific project proposals judged to have a low payoff or to be outside the station scope. Even these, if they are broad projects that obtain tenure along with the professor, are more nearly categories than unique specific research alternatives.

and-returns framework, however, is a harsh taskmaster. It demands such ex ante decisions on the cost side as the following: What information specifically is to be produced? Which investigating technique is most efficient for this information? What sample size of how many replications are needed? How many men, of what kind, for how long will be used in the investigation? How many animals or plants will be used? What will the per unit cost of physical inputs be? Similarly on the returns side the cost-and-returns framework demands that the scientists estimate specifically what information the investigation will turn out and how it can be used. They must project a chain of output items such as the following: From the investigation contemplated, which new relationships will be better understood? As a result of understanding these relationships, which current production practice on which product might conceivably be altered? If some production practice on some product is to be altered, in what form would the release ultimately be made that would contain the information to be generated? To obtain the final form, what other investigations would have to be done? How much time and how much cost would these require? If all the auxiliary investigations were completed, to whom would the release be made? How many users are there? How much would each user be affected and how many total resources would be saved year by year in the economy as a result of the ultimate release of the research being considered for investment? Similar chains of projections, with uncertainty at each step, are required on the returns side with respect to each research alternative with respect to each goal.

Each of the three goals is broad and quite ultimate. Indeed, each is a complex of subgoals. Perhaps ideally one should estimate the impact on each subgoal of each research alternative and aggregate the subgoals by use of internal weights. However, the weights differ among groups of people within the state or nation. It was not possible, we found, at least in the time allotted, to develop empirically the weights among subgoals or even goals that met the needs of an accurate and quantitative benefit—cost model. If the model were to be operational, it had to be designed to use no more resources than were acceptable to the station administration. Of the several limiting resources, including our own time, perhaps the most constraining factor was the necessity of designing the model so that its execution would not overtax the patience of the scientific staff. Because of limited resources for estimation, the model had to be simplified in several ways. First, for example, the goal structure had to be limited to three goals with no subgoals. Second, the quantification of benefits had to be curtailed. Finally, it was necessary to develop the model and procedures in steps or stages, to use only the growth goal at first and even for growth to have little or no dependence on quantification (units affected by years or amount of effect per unit). To try to make the procedure more acceptable to scientists, the procedure depended on implicit estimation of goal effects and implicit weighting of subgoals.

The framework of social costs and returns, even when simplified, was sufficiently demanding to bring forth some protests from virtually every panel of scientists. Many scientists in our specialized society today seldom think beyond the report or scientific product to the use of the information and its social impact. Some find it nearly impossible and unnecessary to project the ultimate practical application of specific research. Our experience seems to show that it is a difficult task for scientists to identify the linkages from specific research investment alternatives to social return (that is, social goal attainment). Nevertheless, the rational allocation of research resources requires costs-and-returns estimates before resources are committed. It is pleasant to report also, however, that some panels of scientists found proposing and evaluating research in this manner a stimulating, logical, and intellectually satisfying experience.

Although estimating the return on future research alternatives requires imagination and is hard intellectual work, the creative phase of research planning is the identification and description of the alternatives. The evaluation, selection, and programming, over a period of time, of research investments is very important in the rationalization of research investment. The potential worth of the research program, however, does not improve after the specific alternatives are identified. Scientists are best prepared to say what can be done, and they must suggest the alternatives. The quality of the evaluation, though important, should not be at the expense of creativity in suggesting high-quality alternatives.

Organizing a Project of Research Program Planning

To choose among a set of alternatives requires that one have all the future alternatives available at one time. This is not normally the case. Seldom in decision-making does one ever have all the "good" alternatives presented at once. In fact, this procedural goal probably is never attained. Certainly in research all the good new research ideas do not automatically occur to scientists at the moment alternatives are called for. Nevertheless, a significant portion of the total gain in research resource allocation efficiency which we anticipated was expected to come from simultaneously considering more good alternatives than had normally been presented at one time before.

To allocate resources meaningfully, it is necessary to be able to place resources where one intends. Resources destined for what is thought to be a high-valued use must, in fact, be used in that way. Thus, it seems that research alternatives should be fully included in the plan or completely eliminated on the basis of total return relative to total cost. Considerable gain in total station resource efficiency is hoped for from funding more adequately and with more certainty those alternatives judged to have high payoff relative to cost. Hopefully the procedure will also more thoroughly discourage attention and use of public resources for those research alternatives judged relatively poor investments by a panel of scientists.

Preparing a goal-maximizing research plan requires considerable knowledge of what scientific investigations could be made and what would likely be the outcome. Knowledge is generated by scientists each of whom is a small-scale administrator in charge of a part of a station's resources. Thus, a research plan is both made and executed with power (knowledge) in the minds of the scientific staff. The hope of this procedure for planning was to enlist and mobilize systematically the best thinking of the staff on what could and ought to be done to be most socially responsible in the use of the station's resources. Thus, it is anticipated that the plan will be as good a one as can be made at the moment for the goals articulated. The expectation then is that most of the staff will understand the basis on which resources are allocated and will make individual decisions consistent with the plan.

The key organizational elements in the procedure for planning currently in process at Iowa are as follows:

1. Divide the defined range of responsibility of the experiment station into 19 panel areas. Each panel of scientists is responsible for initial planning of a defined portion of the experiment station's scope.
2. Provide each panel with a rather detailed manual of guidelines and procedures on (1) how to conduct the panel's operation, (2) how to estimate costs and apply the growth criterion, and (3) how to report the ranked research alternatives for the first phase, which considers only the growth goal.
3. Use the same panel areas but form special teams to rank the alternatives of each panel area with respect to the equity and again with respect to security.
4. Form second-level panels to aggregate across panels and across goals. The research alternative will, thus, originate and be ranked with respect to goals by the scientists and only aggregated by second-level panels.
5. Program the plan over a period of time and among departments.

The scope of the experiment station at Iowa was defined to include research on several significant Iowa agricultural commodities, on agricultural resources, and on the organization and management of processes and firms closely related to agriculture or located in rural areas (of less than 5,000 population per urban center). The total scope was broken into 19 panels of three types—commodities, resources, and organization–management.[6] The scope of each panel area was defined also, and routes to growth were indicated within each panel area. The panels cut across academic disciplines, but the scope of the experiment station was exhausted and research of all disciplines could be included.

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[6] Commodities—corn and sorghum, soybeans, small grain and forage, horticulture, forestry, beef, swine, poultry, dairy, fish and wildlife, commodity processing, and services. Resources—soil and water, air and climate, and human resources. Organiza-

One might subdivide the station for planning purposes along existing departmental lines. This would facilitate control of the execution of the plan once it was made [1]. It was thought, however, that a better plan would be obtained from placing the scientists in unfamiliar but functional groupings. It was hoped that the functional groups would reduce competition between departments and disciplines and focus the competition where it belonged, between individual investment alternatives divorced from specific men and departments.

The guidelines given to each panel concentrated on (*a*) defining the responsibility of the panel and (*b*) outlining the procedure to evaluate research.[7] It is difficult to give instructions on how to suggest alternatives. Much of the difficulty encountered by the panels, however, was in formulating research alternatives in such a manner that each could be evaluated by cost–returns analysis. Several panels found that they disagreed very widely about rankings but reduced this disagreement by further design and description of the contended alternative. The information to be produced and the investigations to be conducted must be specified as unambiguously as possible if benefit–cost analysis is to be applied effectively.

Early in the design of the method a rather fully quantitative procedure was developed for estimating growth contributions. This was designed for application to soybean research [5]. At that time, it was expected that quantitative procedure would be needed to achieve agreement on ranking. Now we have more confidence that rankings can be made without quantification of returns. The development of a quantitative procedure, however, was extremely helpful to us in identifying the relevant variables and in constructing a cost–growth benefit ratio.[8]

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tion and management—farms and rural households, agricultural markets, rural business and services, and outdoor recreation.

[7] Parallel but specific instructions with forms and examples were written and duplicated for each panel member. Meetings were held with panel chairmen and the station administrators.

[8] The model was specified as follows: Eleven variables were to be taken into account in estimating growth-contribution benefits and costs. The variables and selection criteria were as follows:

> P_1 is the probability of a successful research outcome, that is, the probability that the expected new knowledge or package of information from the research will, in fact, be produced.
>
> E_1 is the direct cost of doing the research, that is, the value of the resource estimated to be used up in generating the expected package of new knowledge.
>
> D_1 is the discount coefficient for direct cost, that is, the coefficient to be applied to costs during the research production period to obtain the present value of resources used up.
>
> R is the resource-saving effect per unit of product (output), that is, the dollar

If a quantitative procedure to estimate growth–cost ratios had been used, the "meshing" or aggregation of priority rankings across panels with respect to the growth goal would have been purely mechanical or mathematical. If a quantitative procedure could have been developed so that equity–cost and security–cost ratios had been available, and if constant weights or even weight schedules could have been provided, the work of aggregating both across panels and across goals would have been reduced to a purely mathematical process too. However, such explicit quantification was not possible.

Thus, the second-level panels have a very key role. With neither explicit quantitative growth-contribution estimates nor cost–growth ratios, the second-level panel must aggregate plans across panels. Similarly, with mere ordinal rankings of research alternatives with respect to equity and security, they must aggregate or "mesh" rankings across three goals. It is clear that the need for the role of the second-level panel, and a crucial role it is, was created by lack of quantification by the panels of scientists of the benefits of each unique research alternative.

If the second-level panels can complete their tasks, and if a final station-wide priority ranking of new research to be started is available, the task left is implementation.[9] This involves several parts. The plan must be

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value of resources saved per unit of product to which the new knowledge in final releasable form is applied.

A is the level of adoption of final releasable form expressed in accumulated units of product effect, that is, the number of units of product expected to be affected by the resource-saving effect.

E_2 is the public cost of achieving a level of awareness consistent with the level of adoption estimate.

D_2 is the discount coefficient for public cost of dissemination, that is, the coefficient to be applied to costs during the dissemination period to obtain the present value of resources used.

E_3 is the associated research and development cost, that is, the dollar value of the resource used up in further research and development activities to transform the package of new knowledge into the form necessary to induce the resource-saving effects. This would tend to be small with highly applied research and larger with more basic research.

P_2 is the probability that the associated research and development effort will be undertaken.

P_3 is the probability that if the associated research and development effort is undertaken, it will be successful.

D_3 is the discount coefficient for total resources saved, that is, the coefficient to be applied to the accumulated resource saved over the period of effects to obtain the present value of future resources saved.

G is the expected accumulated discount value of total resources saved (growth benefit), or $[E_{t_0-t_n} (R \cdot A \cdot D_3)] [P_1 \cdot P_2 \cdot P_3]$.

C is the expected accumulated discounted total cost of inducing the growth benefit, or $(E_1 \cdot D_1) + (E_2 \cdot D_2) + [E_{t_0-t_n} (E_2 \cdot D_2)] [P_1 \cdot P_2 \cdot P_3]$.

G/G is the selection criterion.

[9] As of August 1, 1968, the Iowa project had not yet entered this phase.

"crosswalked" or translated from budgets for each alternative and a total annual budget for the station to departmental budgets. That is, the station's resources of money and positions must be administered by departments (controlled) so as to be used to produce the information packages specified in the plan.

The resources of the station are, of course, currently all fully employed. They are employed, however, on research different from the research alternatives of the plan. This research must be analyzed to determine the exact packages of information in process of production now and the additional resources required to complete them. Even though part of the total original cost is already expended, the current research logically might still be evaluated to see if the remaining unexpended cost is justified by the expected results.

It is assumed that all current information packages in process can be completed in less than five years. Thus, all the station's resources should become available sometime within the next five years, and the plan made in 1968 could be progressively implemented and in full operation by 1973. Of course, probably long before then, the plan will be altered by new suggestions, which when evaluated would be higher priority than some of the packages of information slated for production in the original plan. The plan, therefore, would probably have to be constantly changed and updated.

Conclusion and Tentative Evaluation

If one accepts research as a social investment, then it follows logically that one should systematically plan the research program to maximize social return for scarce resources. To try to apply a cost-and-returns framework to research is a challenging professional economic activity. The undertaking is welcomed by some scientists and found exasperating and nearly impossible by others.

The most intellectually satisfying procedure is to quantify cost and returns and calculate absolute cost–growth, cost–equity, and cost–security ratios. However, the improvement of the social return on station research depends very heavily also on creativity by scientists in suggesting high-quality research alternatives. Improving the public satisfaction with the experiment station also requires proper perception of the true goals and the appropriate weights among the goals held by the public. There must, therefore, be a balance in planning an experiment station program between the emphasis on quantitative benefit estimation and the emphasis on finding really effective ways to study society's truly serious problems.

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Discussion: Evaluation and Planning of Research in the Experiment Station

GEORGE K. BRINEGAR

The paper presented by Professors Paulsen and Kaldor, the one I was asked to focus upon, as well as the one by Director Ratchford, is first-rate. I do not wish to quarrel with them for what was said—I will, however, take them to task for not saying a bit more. In a way, this type of criticism is unfair because all authors, including this one, always wish that they had been able to do more—I, therefore, apologize and continue uninhibited.

I wish to focus upon the problem of measuring the economic gains from research and education. Paulsen and Kaldor take up this problem in their points two and three, "specifying the substance . . . [and] . . . estimating the expected rate of social return" in their paper. Ratchford also considers this a problem, and I quote: "Dr. Hitch recently warned that the apparently high economic returns to education could be very misleading because the real returns are much higher."

The analytical machinery used by the authors of both papers is that of micro neoclassical economics in the best tradition of equating returns at the margins with the optimum, defined as reached when first-, second-, and third-order conditions are fulfilled. In logic there is nothing wrong with this approach, and no other method has satisfactory answers for the limitations of this model. However, the measurement problem, in fact, be-

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GEORGE K. BRINEGAR *is director of international programs at the University of Illinois.*

comes so complex that I think it is doubtful if anyone will conduct the necessary studies. Let me present a historical example which may well be a useful analogue.

During the early 1930's, pre-Keynesian, a number of economists at the University of Chicago developed, on the basis of neoclassical analysis, recommendations for monetary–fiscal policy that were similar to those later developed from Keynesian analysis. However, no attention was paid to these recommendations by action agencies. When similar recommendations were made on the basis of Keynesian analysis, the world took notice and action followed. I wish to suggest that we need a Keynesian revolution in the analysis and measurements of gains from research and education—assuming that economists want to talk not only to economists but also to others, including policy-makers, politicians, and the general public.

A Keynesian revolution is needed if the micro gains from education and research are to be measured and taken into account in the allocation of resources. Let me present the following examples to illustrate the notion:

1. Assume that 10,000 heads of households receive vocational training which enables them to shift from welfare cases to employment. The usual micro analysis would stop with estimates of (1) the reduction in welfare payments plus (2) income receipts of the wage earner. Usually the secondary effect will not be estimated. What about (*a*) the expenditure effect during periods of both full employment and unemployment, (*b*) the production effects of the increase in the labor force, (*c*) the consumption effects of continued employment, and (*d*) the effects on the family?—just to mention a few of the logical secondary effects. Why can't we develop a "multiplier" to estimate total effects?

2. Assume that a "G.I. Bill of Rights" is passed. The usual micro analysis stopped with the primary effects. Why not develop a "multiplier" which can take account of all the secondary effects which follow in the next 20 or so years?

3. Assume that there are technological breakthroughs, such as reducing the cost of raising corn, lowering the price of poultry, or developing the transistor. Can we develop "multipliers" or is each case a special case that can only be treated as a unique case?

4. Assume that substitute products are developed for monopolized industries such as railroads, or that new methods of financing housing (FHA loan insurance) are developed. Can we develop "multipliers" to take account of the lagged effects?

I wish to take the position that (1) the long-term secondary effects of research and education are normally more important than the short-term effects, (2) the micro analyses usually measure only the short-term effects, and (3) if we want to optimize the allocation of resources to education and research, all of the effects must be taken into account.

Thus, I conclude that we need an "analytical revolution" which will help the political economist to make better, more understandable, and lower-cost estimates of the effects of choice on the allocation of resources to education, research, and other alternatives.

Some Questions for Economists and Society About Adult Education

C. B. RATCHFORD

DRS. Bishop and Stanton made it clear in issuing the invitation to give this paper that it should not be directed to education in general but limited to adult, extension, or continuing education.

For purposes of this paper, adult education, which is the label that will be used consistently, includes activities which are deliberately planned and undertaken with the intent of changing the knowledge, skills, and/or attitudes of participating adults (those past high school age) who are not regularly matriculated in colleges. The words "deliberately planned and undertaken" are emphasized because a person can learn from almost every conversation or experience;[1] but these accidental educational experiences cannot be identified and costs and benefits determined. Included are only those activities where education is intended by sponsor and participant. Advertising and political speeches are excluded although both often do result in education as defined above.

This is a large and the most rapidly growing segment of education. The federal government will spend over three billion dollars this year for educating adults of the country and probably another billion for educating its own personnel. State and local governments, schools, colleges, and universities will invest over a billion dollars in adult education. Atlhough hard estimates of expenditures of the private sector are difficult to get, it has been indicated that private industry spends 15 to 17 billion dollars annually for adult education.[2] If income foregone as a result of participation in the educational activities is included, the expenditures are staggering in magnitude. These estimates are given to provide a rough idea of the present size of the subject under discussion. The vagueness of the estimates is a warning of difficulties encountered in developing this paper.

Though still meager, there is a growing interest in model building and empirical research on the economics of education. The best summary of the current status of this research is given by T. W. Schultz [10]. Additional research is substantiating his original thesis that education builds human capital and that this accounts for a major part of the unexplained growth of society. These studies are leading to an all-inclusive concept of

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[1] Haggstrom argues that many adults with relatively little formal education can be given further education only through a social action movement and most learning of adults occurs through self-instruction [5]. There is ample evidence to dispute this theory but learning through experience does occur.

[2] These estimates were supplied by A. A. Liveright of CSLEA in a letter to me dated March 26, 1968. He ascribes the estimates to J. R. Miles, manager of the Education Department of the U.S. Chamber of Commerce.

C. B. RATCHFORD *is vice-president of the University of Missouri.*

capital. He also points out that making the central concept in capital theory the rate of return on investment has limitations when applied to education because of "the lack of efficiency or shadow prices" [10, p. 296]. Schultz concludes by preferring "to think of the reciprocal of the rate of return as the *price of an income stream* and then treat the price of an additional income stream as the price of growth" [10, p. 308]. Linear programming models developed for planning purposes for allocating educational investments are identified [10, p. 299]. Progress is traced in determining benefits and costs, including arguments for including and difficulties involved in determining cost of income foregone. The problem created by a short investment horizon, both by the public and private sectors, in light of the long-range returns from education is stressed. Almost as a postscript, the consumptive value of education is flagged.

Schultz leaves the impression that model building is progressing well but that the empirical analyses are lagging. In the same journal issue, Blaug concludes, relating specifically to Great Britain, that "theories have outrun the facts" [2, p. 346].

Practically all the work has been concerned with formal education. General models have not been developed for adult education. It can be assumed that the basic models for education apply but in terms of details they probably differ as much as other production functions in the economy. For example, consider the probable difference in demand schedules between two classes of adults: first, the young, well-trained professional with relatively high income and even higher ambition; and second, the middle-aged, unemployed, illiterate male of a minority race. Some insight into the problem is given by Becker in his *Theoretical Analysis of Investment in Human Capital* [1]. His major contribution is to highlight the problem of private vis-à-vis public investment and relative returns and to note that the distinction may be more pronounced in adults than in youth. The best empirical study supporting a theoretical framework for adult education was made by Mincer [9]. He studied the cost of and returns for on-the-job training; and although he presented a generalized model, his empirical evidence related primarily to apprenticeship training and related experiences which are largely a substitute for so-called formal education.

To use the words of Schultz, the study of the economics of adult education is "in very bad repair" [10]. We are without specific models and facts. Many thousands of pages have been written to prove the value of adult education but most of these were prepared to justify additional funding. Although it is hard to believe, we have only within a very broad range any idea of the number of participants, of the cost by any definition, and of returns either to the individual or to society.

The balance of the paper is devoted to a concise history of adult education because this is important to understanding the crosscurrents and difficulties faced in making sense in economic and political terms of the present situation; and this will be followed by some questions of concern to society which economists can help answer.

Brief History of Adult Education

The first planned adult education effort was the "folk" movement in Denmark, which was in full bloom over 300 years ago and was designed to reshape a national culture [4, p. 13]. The second effort was associated with the movement of the "working class" in Britain almost a hundred years later [4, p. 14]. The objective was to strengthen the hand of the underprivileged, which interestingly is a major thrust of the Office of Economic Opportunity. The first major programs in our country were the "Lyceums" which started in 1826 and the "Chautauquas" which started in 1871 [4, pp. 14–19]. It is somewhat characteristic of the American culture that both turned into commercial lecture circuits.

A number of universities, with private ones located in major cities in the lead, started general extension programs in the years following the war between the states, with local businessmen and professionals as the major clients.

The founding of Cooperative Extension in 1914 was a milestone in several respects. It represented the first major commitment of public funds for adult education, was nationwide in scope, and was the first publicly supported mission-oriented adult educational enterprise—the mission being to help insure a plentiful supply of high-quality food and fiber and to improve the lot of the relatively disadvantaged rural people. Cooperative Extension proved to be a viable institution, gaining continued financial support at the several governmental levels and effectively accomplishing its mission. No attempt was made to duplicate this successful enterprise in other areas for many years.[3] Apparent reasons include (1) identifying its acknowledged success as relating to something peculiar about the primary clientele—farmers and rural people, (2) failure to recognize the programs as educational in nature, and (3) a strong continuing sentiment that *public* support for adult education was not desirable, since benefits went only to the individual participant in terms of economic advancement or personal satisfaction. Parenthetically, the failure to recognize the Cooperative Extension Service as an educational agency is not surprising in view of its radical departure from traditional educational approaches.

One clear result of the lack of public support for adult education was the skewed pattern of participation. Excepting clientele of the Cooperative Extension Service, a majority of the participants were professionals who usually had a "built-in" retraining requirement, such as teachers who had to take additional schooling to keep their certificates, and those individuals with time and money who found organized adult education programs interesting and/or useful.

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[3] The Smith–Hughes Vocational Act was passed shortly after the Smith–Lever Act; but until recently it has been primarily concerned with youth. The Vocational Rehabilitation Act is also concerned with adult education but is limited in terms of clientele to the disabled.

The thirties brought new experiments in public support for adult education, with the Civilian Conservation Corps and the National Youth Administration as major thrusts. The overruling objective of these efforts was to find something—literally anything—for people to do. Educational benefits were purely incidental. The later success of many participants in the programs, however, provided the background for some of the current adult educational programs.

Very large adult education programs were conducted during World War II, but the sole objective was to get more people into the work force and armed forces and to upgrade skills so that the war effort could be more successfully prosecuted. These programs were successful, but their significance as a more generalized tool for achieving certain national goals or missions was overlooked because of their total identification with the war effort.

The period from the end of World War II to the sixties saw a rather sharp growth in adult education. The greatest push came from the "G. I. Bill of Rights." While this is considered highly successful, it was developed as a fringe benefit for veterans, with the anticipated educational benefits to the individual and society being incidental. Policy-makers, remembering the bonus march of the thirties, thought the opportunity cost of education would be lower than for some other alternatives.

During this period there was a significant growth in several other areas. The federal establishment and large-scale business and industry began to invest large sums in employee training programs, particularly for middle management, scientific personnel, and the technical sales representatives. Professionals began to invest more personnel resources in retraining. With the exception of investment by the federal government in training its own employees, most of the increased expenditures came from the private sector, and a majority of the new participants were the better educated.[4] This growth was the result of an increasing awareness of the technological revolution, which was rendering obsolete much of the human capital built through formal education, and the realization that increasingly there was no opportunity for the uneducated.

The decade of the sixties brought an explosion in almost all phases of adult education, and a massive public investment in mission-oriented activities. The greatest expenditure has been for the general area of increasing employment and eliminating poverty, and includes, among others, the Manpower Development and Training Act, Adult Basic Literacy, Titles IV and V of the Economic Opportunities Act, the revisions of the Vocational Training Acts, the Job Corps, and the New Careers Program of the Department of Labor. The federal establishment has opened many new programs for its own employees, the largest being those of the Department of Defense and the Post Office, and has expanded existing educational programs directed to improving performance in present jobs or qualifying staff for higher-level positions. New programs with the mission of enhancing economic development include the State Technical Service Act and the technology transfer programs of the Department of Defense and the Atomic Energy Commission. For the first time, major public investments have been authorized for professional re-education through the National Science Foundation, the National Institutes of Health, the Education Professions Act, and a host of health acts, including the Regional Medical Programs. Training of employees and leaders in state and local government has not been overlooked, with specific attention given to these in Title I of the Higher Education Act of 1965, Titles VIII and IX of the Housing and Urban Development Act, and new programs of the Department of Justice in law enforcement and juvenile delinquency. The only major omissions at the federal level have been in education for personal development (a very minor start has been made in this through the Arts and Humanities Foundation), in public affairs, and in the true consumptive aspects of education.

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[4] A colleague suggests that this may mean a difference in opportunity cost of continuing education with degree of specialization and present level of income and education. This is likely true, but the variation in participation is more closely related to one's knowledge of the opportunity costs. Those who knew or thought about opportunity costs did participate in adult education programs, whereas many others who had high opportunity costs did not because they were not perceived.

State and local governments have substantially increased expenditures for adult education, partially no doubt as a result of mandatory matching requirements of some federal programs. This latter point must not be pushed too hard, however, because state and local governments exceed by far mandatory matching requirements for Cooperative Extension Service and vocational programs, the two oldest adult educational programs.

The private sector, including corporations, labor unions, trade associations, and individuals, has also increased its investment in adult education. Part of this, such as expenditures by industry for training the disadvantaged, is to support national policy; but most is considered necessary to achieve goals of the private sector in the fast-changing specialized world.

The country ends up in 1968 with massive expenditures, at least a fourth of the total population involved, and participation skewed heavily to those areas for which there is federal support. If the effect of new federally financed and/or initiated programs can be discounted, it appears that there has been a steady growth, at an accelerated pace, in participation for professional and personal development from the private sector.

Concurrent with the expansion has come a great growth and proliferation of organizations and institutions offering instruction. The established educational institutions have sharply expanded their programs. Both government and industry have increased in-house training programs. Many not-for-profit organizations such as community-action agencies and research institutes have come into the picture.

Private business has also sharply expanded its efforts. Until quite recently, most of this education was for its own employees or was directly related to sales promotion, an example being the training programs of computer manufacturers for potential customers. A completely new development is private business operating educational programs to make a profit. To date most of this has been conducted under contract with the federal government, an example being the Job Corps centers. Some firms believe, however, that through the use of programmed instruction and new teaching hardware, including computers, a good-quality program can be conducted and a profit earned. A major factor contributing to the optimism of these firms is the very traditional and unimaginative approach of most of the educational establishment.

There are several reasons for this explosion in all aspects of adult education. The technological revolution, dramatized by automation and sputnik, forced recognition of the need for retraining and up-grading all segments of the work force. Achieving some of the social goals of the new frontier and great society, such as eliminating the poverty culture, obviously require an educational component. Although it is easy to justify the increase on the basis of real needs, some were started out of desperation—no one had a better answer or at least one which was politically acceptable.

Several differences in policy in adult education from formal education are worth noting [7]. In adult education, the federal government has been the dominant factor; it is highly mission-directed, and the federal establishment has deliberately encouraged the development of new forms.

Some Questions About Adult Education

1. *Should providing life-long learning opportunities for all be the national policy?*

The country has a policy of providing, largely at public expense, the opportunity for all to complete elementary and secondary schooling. Indeed, participation is mandatory. The country is close to a similar policy for higher education for those individuals with the capacity for it. As the historical review made crystal clear, the country is far from such a posture for continuing education. Although funds are available for specific missions, any administrator of a university general extension division or a high school adult education program can testify long and eloquently that the public is far from approving substantial public funds to support a general adult education program. This positive and strong stand is based upon the traditional views of the type and value of adult education and with little examination of some of the economic and social costs and returns.

The concept of education as a creator of capital is generally accepted. Capital obsolescence is also a highly relevant concern of society. Capital created through formal education does become obsolete in a time of rapid technical and social change. This is particularly serious because society does not permit final destruction of humans as it does other forms of capital. Adult education is a means of preventing obsolescence of the human capital developed through education of the young and can even add to the quantity and quality. Though recognizing that there are many debatable items about who pays the cost, one cannot help but question the economic value of a policy which makes massive public investments in education up to some given age and then does not make essentially any expenditure to maintain or improve the initial investment.

The country has a stated goal of equality of opportunity and is using a wide variety of means to achieve the end. The wide difference in level of education is a major contributor to unequal opportunity. A large investment in what can be labeled "remedial education for adults" is required to correct this situation with the present generation. This condition raises several interesting questions. Recognizing that funds are always limited, would a higher return be received from additional investment in education of the youth and by this investment could we hope to avoid such unequal education of the next generation or to correct the situation with the present generation of adults? An argument can be made to split the investment. Although investment to prevent future educational inequality will give high long-range returns, it seems fair to assume that regardless of what is done in education of youth, there will continue to be differences that will need to be corrected later in order to achieve the equality goal. Further, the schools may reach a limit in what they can do for some youths unless there is some concurrent development of the adults with whom the youths relate.

Another reason for some public investment in life-long learning arises from the high rate of technical change and its impact on social and economic organization [3]. The institutions and the general population are presently incapable of adjusting to the rate of change, and this is creating social pathologies which have extremely high costs. Economic and social stability is a high-priority national goal; and in a free society continuing education appears to be an immediate means for helping correct the situations which seriously threaten the stability of the economic, social, and political systems.

Some of the consumptive aspects of adult education have relevance to the central question under consideration. As efforts are increased to spread the work available to a greater part of the potential work force, most of the population will have more leisure time, and it is already certain that finding a use for this that benefits the individual and society will be a problem for the individual and society. Some steel mill workers are now away from work for three consecutive months with pay, and the social costs resulting from how this time is spent are apparently high. Medical advances plus the push for early retirement are creating a rapidly growing group of people who have "time on their hands" and the results of this are also well known. There is evidence that spending some of this time in education is therapeutic and, in addition to reducing some measurable economic costs such as medical bills, reduces social costs. For many of these people, the cost of education is a factor in determining participation. The consumptive role of education needs much more consideration.

2. *How effective is education in achieving the assigned missions?*

The historical overview called attention to the fact that several adult education programs have very specific missions. The State Technical Services Act and the technology "spin-off" programs of the National Aeronautics and Space Administration are supposed to bring about economic development, increase employment, and improve the balance of payments. Several of the Office of Economic Opportunity and Department of Labor programs are designed to reduce the number of hard-core unemployed. Title I of the Higher Education Act of 1965 is supposed to bring institutional change.

An important question, simple to state but hard to answer, is the extent to which education is achieving the objectives. There are difficult conceptual problems relating to the determination of costs and benefits and the empirical evidence will be difficult to secure. The answer to this question is needed not only to determine whether benefits exceed cost but also to guide additional investment. Surely the returns from the several programs are not the same, but, lacking knowledge on returns, allocation will continue to be made in a haphazard manner.

The empirical analyses needed to answer the question are made more difficult by having to consider long-run as well as short-run results. There is increasingly a suspicion that long-run results of educational programs with the goal of giving immediate employment do not have the long-run benefits normally associated with education. More will be said about this later.

Another important question is the "payoff" from mission-directed education vis-à-vis expenditures for alternatives to achieve the same goal. For example, what would be the returns from spending money presently used ning groups reveals the desire for education which not only helps solve immediate problems but also broadens the individual. The labor unions, which have conducted educational programs for many years, are now devoting a larger percentage of the program to non–job- or union-related matters.

A different reason for less specialized programs relates to the long-run value of education. Schultz makes very strongly the point that capital formed through education is subject to obsolescence [10, pp. 303–307]. He also notes the relatively short investment horizon and the difficult problem which this creates in arriving at an optimum allocation of resources for the several components of education; he literally pleads with economists to give more attention to these problems because "surely the rate of obsolescence of what we teach and students learn is higher than it need be" [10, p. 306]. One of the means available to solve this problem is to generalize the training as much as possible, stressing principles and theories and methods of problem-solving.

It is interesting that the federal government, which should have the longest investment horizon and which is not subject to some types of risks that the individual faces, is behind the private sector, including individuals, in generalizing many of its educational programs for adults. A number of the Labor Department programs insist not only on training for a specific skill, but also on having it be given by a prospective employer. This compounds the chances of the investment's being a poor one, for not only may the skill become obsolete, but also the employing firm may cease to exist.[5]

The points just made raise a question about the desirability of generalizing the present programs vis-à-vis making funds available for general or liberal education to supplement the existing programs or a combination of both. One characteristic of Cooperative Extension which has contributed to its success is the great amount of freedom in programming. The training offered under provisions of the "G. I. Bill of Rights," which is judged as having been a good investment, permitted great flexibility and participation in liberal education.

4. *Who bears the cost of adult education?*

Prior discussion reveals a very mixed situation, with some individuals being paid with public funds to go to school and, at the other extreme, some individuals bearing the entire cost.

Several alternative situations are given to shed light on some of the specific aspects of the question.

a) One situation is where the individual receives substantial benefit and is illustrated by an individual who is certain that by taking additional training his real income will be sharply increased. An example might be a clerk who becomes qualified and serves as a computer programmer. It could be argued that this individual should bear the total cost. Insert a minor variation, however, and examine the outcome. Assume that there is a shortage of computer programmers which is delaying the achievement of some important national goal, such as winning the war in Viet Nam. Even though the individuals trained might receive higher personal income, the situation might justify the public sector's paying the entire cost. Another variation is the individual who may receive great personal gain but who cannot pay the cost. The long-term unemployed fall into this category. The background and experience of these people is such that they would not borrow for education even if it were possible. The answer to this last situation is more obvious if society is bearing a cash cost for such individuals in the form of welfare payments.

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[5] A major exception is the fairly extensive support for libraries. There, funds have practically no restrictions.

b) The second situation is where essentially all benefits accrue to society. Public affairs education comes close to being in this category, for the goal is increasing the interest and ability of citizens to participate in public matters. Many rate such work as extremely important; but those who should participate will not pay the cost. If such programs are to exist, the public sector must bear the cost.

c) A third situation occurs when the benefits are shared by society and the individual. Work under the State Technical Service Act falls into this category. Individual participants increase their incomes, but national goals, such as creation of new jobs, are also achieved. This act recognizes this situation and does encourage the users to pay part of the cost. On average this works out fine; but if one objective is getting to the "hard to reach" and poorly motivated manufacturers, the total cost must be paid by the public sector. This poses a very sticky but practical problem of whether a charge can or should be made to some and not to others for the same program.

These situations show that a completely uniform policy is not necessary even if such were politically acceptable. It is clear that society must bear the total cost of some education for some people if they are to participate at all. A good case can be made for some public support for almost all adult education, for society does receive some benefit from higher personal incomes, better qualified medical personnel, etc.

5. *Who does the adult education?*

It was noted earlier that many different types of institutions and agencies are conducting adult educational programs and that proliferation is increasing at a geometric ratio. Relative efficiency in terms of achieving the stated objectives has played little part in the public decisions which have contributed to this situation; not that the importance of efficiency is questioned, but the data on which such judgments can be made are not available. Except for the practical difficulties involved in determining costs and returns, this is a straightforward economic analysis; but assuming that there is a marked difference in efficiency, it is a problem worth studying.

A question which proponents of new forms have raised is whether the organized educational establishment is willing and able to take over the training which was requested. The answer is an unequivocal yes; but it is not willing to accept all the restrictions, because answers are not available on the merits of different methods and the mix of general or liberal education vis-à-vis training in specific vocational subjects.

A somewhat more difficult issue is the amount of training that is performed in-house by government and business vis-à-vis that performed by educational institutions. Some of the training must be done by the employing agency; but is it more efficient to have the generalized training performed by an educational institution? Organizations currently follow widely different patterns. Some private and public organizations prefer to have most training done by others, even though they bear the full cost. The labor unions are in the lead in this direction. Others go to the other extreme; and there is little evidence that either group is guided by knowledge of which course gives the best results.

If it turns out that economic analysis reveals that there is a place for many different types of educational organizations and institutions, coordination and communication between types becomes of paramount importance [7]. The formal educational institutions have worked out a division of labor and an internal communication system which, though far from perfect, prevents chaos. A half dozen very different agencies and institutions in a single city trying to attract the same audience to adult basic education classes is a far different situation and apparently has high economic and social costs.

6. *How is innovation secured?*

A major criticism of all education is the failure to innovate in curricula and methods. Adult education apparently has a somewhat better record than the formal educational programs, probably not because of better intentions but as a consequence of highly restricted budgets, the need to sell the programs, and intimate contact with real problems of the world.

The educational fraternity builds in protective tactics which at least slow down the use of techniques such as television films.

One advantage of leaving the door open for anyone to come into the field is that innovation is probably encouraged [7]. This is a technique, however, that should be applied cautiously. A major barrier to innovation to a largely rational group is some measure of effectiveness as indicated by cost–benefit ratios. It is up to the economists to supply this evidence.

A Final Admonition to Economists

The preceding discussion has outlined a major challenge to economists. From the standpoint of personal involvement either as teachers or as professionals who are interested in resource allocation, economists should have an interest in the subject and do have a significant contribution to make. However, we hope without dimming enthusiasm, a caution can be added.

The value of education exceeds that which can be quantified in economic terms. A colleague, upon noticing the subject of this paper, commented as follows: "Economists are the world's worst materialists; why must they try to fit education into their depersonalized system? Is not education a basic human right?" Dr. Charles Hitch recently warned that the apparently high economic returns to education could be very misleading because the real returns are much higher [6]. He cited the value of liberal education in developing moral capacity and ethical standards and the value of ideas. It will be wise to keep in mind what Daniel Webster said over a century ago: "Mind is the great lever of all things; human thought is the means by which human ends are ultimately answered."

Although the economists do not have the final answer, more analysis and refinement of models are essential to development of more rational policies and operations in adult education.

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Discussion: Some Questions for Economists and Society About Adult Education

PETER DORNER

> "In the deepest sense, we are committed to education because it enables one to live more fully in the dimensions that are distinctly human."
>
> John W. Gardner, *No Easy Victories*

Dr. Ratchford has presented an interesting paper and has raised many significant questions about national policies in the area of adult education. Although I agree with much of what he says, in this brief discussion I will focus on points of disagreement.

I was disappointed to see Ratchford exclude from his discussion all activities that are not "deliberately planned" and include only those "where education is intended by sponsor and participant." The reason given for such exclusion was that "these accidental educational experiences cannot be identified and costs and benefits determined." If this criterion is strictly adhered to, then several of the most important questions raised in the paper would also have to be excluded from the discussion.

As a consequence of this choice of criterion, no mention is made of the potentials of national educational television. The fact that such possibilities have not dominated the imagination of those who control the commercial networks is insufficient reason for excluding television from the discussion. Likewise, no mention is made of the significant role of experience in the armed services. In studying the economic development problems of the American Indians several years ago [1], I was struck by the impressive record of mobility and success in adapting to urban employment by the young Indians who had been in the military service relative to those who had not. The Defense Department's current "Project 100,000" is of interest in this respect. Under this program, mental and aptitude test standards were reduced, permitting the induction of previous rejectees. The objective is to urge those with educational deficiencies to pursue basic education while in the service, and to provide all of them with opportunities for assignment to a wide range of military occupational duties, many having close counterparts in the civilian economy [4, pp. 65–66].

Ratchford maintains that the public is far from supporting a general adult education program and ascribes this to traditional views "with no examination of the economic and social costs and returns." The persuasive

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PETER DORNER *is professor of agricultural economics and director of the Land Tenure Center at the University of Wisconsin.*

powers of benefit–cost calculations may be considerable to augment a position already firmly held. But I doubt their efficacy in convincing even "a largely rational group" such as the educational fraternity, where, according to Ratchford, a major barrier to innovation is the absence of some measure of effectiveness as indicated by cost–benefit ratios. Indeed, as Ratchford himself admits, even this largely rational fraternity has a persistent tendency to build in "protective tactics" which slow down the use of new techniques.

Several references are made to the success of cooperative extension in fulfilling its mission in adult education. But this is an evaluation based, quite appropriately, on grounds other than a benefit–cost ratio. Moreover, I find it difficult to reconcile this apparent success of cooperative extension with Ratchford's criticism of Labor Department programs of on-the-job training provided by prospective employers. These programs, says Ratchford, compound "the chances of the investment's being a poor one, for not only may the skill become obsolete, but also the employing firm may cease to exist." Cooperative extension has always been most successful in working with the better farm managers on the larger farms, who, incidentally, are also the main participants in building extension's programs. In order to follow the recommendations of extension workers and to adopt the new practices, farmers had to have the resources to do so or have access to credit by which to acquire them. Had extension education alone been sufficient, would we not expect problems of rural poverty and deprivation to be less serious than they actually are? The idea behind on-the-job training is to assure that resources (an employer with a job) are available to make the training effective. This method may be especially appropriate for the most disadvantaged in the labor force [2, Chap. 4].

Education, and especially adult education, represents an investment in human development in which many inputs and most outputs do not lend themselves to benefit–cost type of measurements. Almost as a postscript, in his "Final Admonition to Economists," Ratchford makes a passing reference to these limitations. Yet he concludes by ignoring the very sensible observation on the nonquantifiable value of education and suggests that the role of the economist is to refine the models—presumably of benefit–cost analysis.

Economists must join in the rough-and-tumble debate on these human yet often unquantifiable issues rather than confine themselves to the purist position of a narrowly conceived concept of rational calculation too often based on dubious assumptions and then rebuking the irrationality of "common men" for not acting on the basis of these calculations.

In his recent book, Hirschman offers some very significant insights on the evaluation of investment projects in the economic development process [3]. I believe that his observations have relevance for the issues here discussed. After a review of the procedures that have been developed in successfully carrying out research and development activities, he concludes that "correct decision making in research and development is therefore sharply distinguished from decision making in known production processes: it is more flexible in goal setting, it relies on multiple and parallel approaches, it is not rigidly coordinated, it is gradual and sequential in that both means and ends of the R and D process are frequently reviewed and modified in the light of newly acquired information" [3, pp. 77–78].

One reviewer of Hirschman's book is reminded of an assertion by Keynes in which he maintained that "half of the world's investments would never have been made on the basis of rational calculations, that a certain spontaneous optimism and even animal spirits may be essential to get the business of life done" [5, p. 34]. Hirschman's essential message is that project analysis must *not* be curbed by an aesthetically elegant benefit–cost methodology, even if it has added to it many noneconomic externalities.

In formal education and in some areas of job training, benefit–cost analysis may be feasible. However, I fail to see the relevance of these measures for many of the most pressing public policy issues of the day. Can anyone seriously maintain that it is this lack of knowledge of benefit–cost ratios that has led to the severe educational neglect of many rural people, of Negroes, of migrant farm workers, of the American Indian? I doubt it! Much more significant than such refined analysis, it seems to me, is to study the multitude of agencies, programs, and methods involved in this training to see the comparative success of getting trainees on jobs and the later adjustment problems experienced by these trainees. Separate evaluations must be made of adult trainees by age groups, by sex, with and without family obligations, by ethinic groups—especially those whose native language is not English—by various categories of mentally and physically handicapped, etc.

In the other classes of adult education mentioned by Ratchford—personal and family, civic and social, and self-realization—benefit–cost analysis is entirely inappropriate since the benefits are too diffused and unquantifiable. And given the present state of our national concerns, adult education in these areas may be even more significant than vocational or occupational training.

Economists should, at this stage and on these issues, be as much concerned with institutional innovation as with the narrower issue of relative efficiency. We should recognize that there is a high degree of uncertainty surrounding these questions, and that, in Hirschman's words, on such matters "implementation may often involve a long voyage of discovery in the most varied domains, from technology to politics" [3, p. 35].

M. L. WILSON BREAKFAST ADDRESSES

M. L. Wilson—Economist, Philosopher, and Man of Action

EDWARD J. BELL, JR.

THE contributions of M. L. Wilson to the agriculture of our time have been so numerous and so varied that it would be impossible to mention even a fraction of them in a short breakfast meeting such as this. The best one can hope to do will be to recall a few of the events of the past 60 years and a few of the ways in which Wilson has shaped the course of history.

It is highly appropriate that we honor Wilson at this meeting of the two associations. He is one of the distinguished past presidents of the AFEA and an early leader of our profession. He is identified with Montana—as a homesteader, as an agronomist, as our first county agent and county agent leader, as extension economist, and as the first head of our department of agricultural economics. From his boundless energy, inquiring mind, fertile imagination, astute psychology, and interest in people came pioneering accomplishments in agronomic practices, leadership development, farm management and farming systems, range management, irrigation development, marketing improvement, and agricultural policies which still are the basis of our farm programs. His interests have covered almost the whole scope of human knowledge—biological and physical sciences, economics, sociology, anthropology, history, philosophy, public administration, nutrition, international relations and development, religion, and, no doubt, many other subjects. But his primary interest has been in obtaining social justice for farmers, with due consideration for the general welfare, with knowledge and ideas from all disciplines used and coordinated to accomplish economic and social objectives [3, pp. 131–141 and 157–178; 5, pp. 1–24].

The period during which Wilson lived in Montana was one of pioneering and change. He had graduated in agronomy at Iowa State College in 1907 and gave Alfred Atkinson, then agronomist and later president of Montana State University, credit for getting him interested in coming to Montana. He homesteaded near Fallon in the southeastern part of the state during the peak period of settlement. The Montana Experiment Station helped the new settlers adapt themselves to semiarid conditions. Substations were established to determine what crops would grow without irrigation and to determine the proper dryland tillage methods. Wilson was appointed assistant in the agronomy department in 1910-11

EDWARD J. BELL, JR., *is a retired agricultural foreign service officer.*

and county agriculturist in Custer County in 1912-13. With the passage of the Smith–Lever Act of 1914, he became county agent leader in the Extension Service [1].

Bumper crops of wheat and high prices of World War I enabled farmers to make "big money" on their 160-acre homesteads, and there seemed to be no limit to Montana's prosperity in 1915. Rust in 1916 and dry weather in the next four years (1917–1920), along with the collapse of prices in 1921, forced thousands of families to move away. Banks went broke along with farmers. So great was the pessimism that people were asking, "Is this a farming country?"

Wilson took leave of absence for graduate work in agricultural economics at Wisconsin in 1919-20 and returned to concentrate on the economic problems of Montana farmers. He interviewed farm families which had remained in localities where hundreds of neighbors had failed. Out of these studies and the experience of farm people emerged a recommended farming system for the dryland areas. The elements of this system included (1) building reserves of soil moisture, feed, and cash, (2) permanent homes with shelter belts, gardens, poultry, milk cows, and pigs to provide supplemental income, (3) livestock where untilled lands provided profitable grazing, (4) improved tillage methods with big teams or tractors to enable each farmer to produce wheat efficiently, and (5) use of flood waters for dryland irrigation [13].

These studies showed the need for drastic adjustments in farm organization and management. H. C. Taylor had expressed the need for an experiment in farm management under actual operating conditions to determine how best to help farmers climb the "agricultural ladder" from tenancy to ownership. Wilson believed that Taylor's idea could be used to meet the needs in Montana. He obtained the interest of nationally known people, including Beardsley Ruml, who was then director of the Laura Spelman Rockefeller Foundation. With the support of Rockefeller funds, the Fairway Farms Corporation of Montana was incorporated in 1924. Richard T. Ely, H. C. Taylor, Chester C. Davis, and a number of Montana farmers and business men were on the board of directors. M. L. Wilson was secretary and managing director [14, 15].

Elmer Starch, who joined the staff in 1926, has described the objectives of the Fairway Farms as follows:

> The purpose of the project was to work out a combination of management factors which would enable producers to meet the hazards imposed by the "dry-land" environment. Farm families were in dire straits as a result of maladjustment in methods and in farm organization. The situation was aggravated by a world market situation. The prospects for a suitable price were poor. Could the costs of production be cut to meet the price? Could a type and size of unit be found that would afford reasonable security? What kind of a farm unit would enable a family to work and live comparably with other members of a middle class society? [8, p. 86]

The corporation acquired eight farm units located to represent problem areas of Montana. A tenant purchase contract was executed with each operator, who agreed to follow directives of the corporation as to farming practices and organization of the farming enterprise.

All departments of the Montana Experiment Station and Extension Service cooperated wholeheartedly with Wilson and Starch in planning the farming systems and practices on the Fairway Farms. With the coming of the medium-sized tractor, the combine, and the truck, wheat-farming in the Great Plains was revolutionized in the late 1920's. Starch showed that with the new techniques labor requirements could be cut two-thirds and the cost per acre of wheat could be reduced to $6.85 in 1930, as compared with $14.87 in 1922 [9].

Information on the new agriculture was presented by exhibition trains, meetings, field days, and demonstrations. Results from the dryland branch stations combined with the experience of farmers on the Fairway Farms and elsewhere helped Montana to take the lead in adopting summer fallow practices, tillage methods, and efficient organization of the farming unit.

While this was going on in Montana, Wilson was also involved in developments of even more far-reaching significance. The depression of 1921 gave rise to agitation for "equality for agriculture." "Stabilization" of farm prices and income, "fair exchange value," the "parity formula," "equalization fee," "export debenture," and "domestic allotment plan" were added to our vocabulary.

Wilson evidently realized that high-yielding varieties and efficient management would not bring Montana farmers sufficient income in the absence of national policies to support prices and control surpluses. Along with other leaders, such as H. C. Taylor, he supported the McNary–Haugen bill, twice passed by Congress and twice vetoed by President Coolidge. Shortly after the formation of the Bureau of Agricultural Economics, Taylor asked Wilson to help reorganize the Division of Farm Management and Costs. For two years, 1924–1926, Wilson was on the payroll of the BAE on leave from MSC but spent much time in Montana in connection with the Fairway Farms project and other activities. At that time, Montana was considered an important laboratory for agricultural economists.

Wilson's presidential address at the annual meeting of the American Farm Economic Association in New York, December 28, 1925, indicates his thinking at that time. His topic was "The Source Material of Economic Research and Points of View in Its Organization." He mentioned that the organization then had 16 years to its credit and had grown from a handful to 800 members. (I understand it is about 4,500 now.) Wilson compared the techniques of biological and economic research, saying, "While the basic economic laws may be fixed and unchanging, the mechanism through which they work is always in a state of flux." The challenge to the economist was stated as follows: "Can the product of agricultural economic research be such that it can be used by the agricultural portion of our population to develop methods and institutions that will enable them to obtain such a share of the national income as to maintain living standards comparable with those engaged in other occupations?" Farm management's province, according to Wilson, lay "essentially in the mediation between technological science on the one hand and economic science on the other." "The job of the economist," he said, "is by no means completed with fact collection. If he is to meet the challenge there yet remains interpretation and synthesis—and arrival at a basis for action in the dynamic realm of economic life."

In the organization of economic facts, Wilson indicated three principal avenues of approach—the individual-farm point of view, the commodity point of view, and the national-program point of view. In connection with the national-program approach, he said,

> The idea of a definite agricultural policy based upon scientific economic knowledge is still in the formative stage. . . . Our policies in the past have been the outgrowth of current economic and political conditions. The same will hold true in the future plus, we hope, the ever increasing influence of science coupled with high ethical and religious values. . . . It is doubtful if enough thought is being given to the methodology of forming policies nor how they may be developed in the minds of rural people, or perhaps we might better say, how may economic facts be given to farm people such that agricultural policies will be to a large degree an expression of the farmers themselves [16, pp. 13–15].

It will be seen from these excerpts from his presidential address that Wilson believed that ideas, if they were any good at all, should be put into action, that the farmers must be fully informed and brought actively into policy-making, and that the whole process should be carried out with high ethical and religious considerations. During subsequent years, he proceeded to put these principles into practice.

A meeting of leading Montan farmers, stockmen, and businessmen was called at Bozeman on January 5, 1927. Director of Extension J. C. Taylor said that a vast amount of information had been accumulated out of more than a half century of research and farm experience. The question was how best to present this information and make it available to the people of the state so that programs of agricultural development might be formed. As a result of the preliminary meeting, committees were appointed and agricultural economic conferences were held in six districts of the state. Wilson's remarks at the economic conferences were entitled "The Need for an Agricultural Program." He called attention to four lines of thought "clearly apparent in the many suggested solutions to the farm problem": (1) national legislation, (2) cooperative marketing, (3) increased farm efficiency, and (4) adjustments in production. The national legislation visualized was one "which seeks to influence, through governmental action, the production of the agricultural surplus so that the portion which is sold and consumed on the domestic market will maintain a closer parity with other commodities and wages" [7, p. 5].

The economic conferences in Montana in 1927 were the forerunners of what later came to be called "economic democracy"—administration of the farm programs by local and state committees of farmers and the county land use planning program. The leadership of Wilson and his friend and associate, Howard Ross Tolley, in connection with these programs has been ably and accurately described by Kirkendall [6]. Further discussion of Wilson's contribution will be found in the papers presented at the M. L. Wilson Symposium at Montana State University, July 1966 [8].

Wilson's ability as an originator and salesman for new ideas is well illustrated by the way in which the farm program of 1933 was brought into being. One of his outstanding characteristics was his interest in people—he was interested in their experiences; he was interested in their philosophy and their reactions to ideas and situations; and he was interested in stimulating them to action. He had found that by adroit questioning he could put ideas into people's heads in such a way that they thought the ideas were their own. This, of course, is one of the best ways to get ideas put into practice. Wilson used this technique with farmers in getting them to adopt improved practices; he used it with his staff, and he used it in selling the domestic allotment plan.

My recollections of events leading up to the agricultural adjustment program of 1933 begin with Wilson's return from a trip abroad in the summer of 1929. While he was away, Congress had passed the Agricultural Marketing Act creating the Federal Farm Board. His old friend, Alexander Legge, had been appointed by President Hoover to serve as chairman of the board. As soon as Wilson arrived on the campus that fall, he wanted to see a copy of the act and he asked what "Old Alex" had been doing and saying about the wheat situation.

One of the first acts of the board had been to make supplemental loans through cooperatives to enable farmers to hold their wheat off the market. This was a part of the "orderly marketing" process advocated at that time. It was also recognized that surpluses were continuing to accumulate and the board had asked farmers to cut their acreage by 10 percent. Wilson wanted to know what the farmers thought about all this and asked Ralph Bodley, extension agent for Gallatin County, to call a meeting. A group of wheat farmers met in the old courtroom in Bozeman. Wilson told them about his recent trip to Russia and other wheat-producing countries and the growing surplus of wheat in the world. He told some stories about Alexander Legge and then brought up the request of the Farm Board for farmers to cut their wheat acreage 10 percent. Were the farmers present going to do it?

This led to a lot of discussion until finally someone said, "M. L., I am willing to cut my acreage if everyone else is doing the same thing. I can see what my neighbors are doing but how can I be sure that people in Kansas and North Dakota and other parts of the country are cutting their acreage?" There was some more discussion and the meeting was adjourned.

On the way home from that evening meeting, Wilson kept asking questions, somewhat to himself. "How can Gallatin County wheat farmers be sure about what people are doing in other states? We've got to have a contract. Who can enforce such a contract?" Finally, "The federal government must have the contract so that every farmer will know that the others are making the same cut." That was in the fall of 1929 and I think it was before the stock market crash.

My next indication as to the trend of the times was at the Montana extension conference a few months later (January 1930). Wilson said that the county agents often asked him what new books they ought to read. Well, that year the book to read was *Agricultural Reform in the United States* by Dr. John D. Black. Particular attention should be paid to Chapter X, "The Domestic Allotment Plan" [2]. I think Wilson also mentioned a smaller booklet by W. J. Spillman on the same subject. But in January 1930, the domestic allotment plan and contracts with farmers to adjust acreage were only ideas. Somebody had to put these ideas into action.

About that time, I left the campus at Bozeman to work for the Farm Board. During the next three years, Wilson made frequent trips to Washington. He talked with members of the board and his old friend, John D. Black, who had taken time off from Harvard to serve as the board's chief economist. Mordecai Ezekiel was John D.'s assistant and played a major role in writing the third annual report, in which it was emphasized that price supports were futile in the absence of production control [4, p. 62].

By the time Franklin D. Roosevelt had been inaugurated in March 1933, the farming community of the United States were pretty well in agreement as to what they wanted in the way of farm legislation. I rather suspect that each leader thought the domestic allotment plan was his own idea. At least, M. L. Wilson had asked each of them what ought to be done. The act passed by Congress at the special session in the spring of 1933 embodied the principles of the domestic allotment plan and provided for a contract between farmers and the government such as Wilson had been talking about in the fall of 1929 [10].

Elmer Starch tells of an incident during this period which illustrates how Wilson thought in terms of the welfare of farmers. One objective of the Fairway experiments was to get the cost of producing wheat to the lowest possible minimum. In the shade of a combine at the Lone Warrior farm near Brockton, Montana, M. L. asked Elmer how low the cost could be brought. At that time it was $6.85 per acre, but even with better than average yields, prices were too low to cover this amount. M. L. then said, "Well, we are going to have to do something about the price of wheat"; and that was the point when Wilson started to devote all his energies to getting the domestic allotment plan adopted.

Staff members of the Department of Agricultural Economics in Bozeman were asked to help work out the details of the plan, and they spent long hours around the table which still has a place of honor in the office of the head of that department.

Consideration of the plan gave rise to countless questions of administration, some of which had been posed in Black's book. Charles C. Conser, former state senator and leading farmer in southeastern Montana, had joined the staff of the Department of Agricultural Economics at Bozeman in 1930. He, along with other members of the department, considered how to handle the administrative problems of the proposed program. Conser went to Washington early in 1933 to help Wilson draft the rules and regulations for the first contract.

One of the issues was whether the program would be administered by paid employees or by farmer committees. On this point Wilson stood firm and won out in favor of the principle of economic democracy which he had advocated as president of the AFEA in 1925 [16].

This then was the birth of the AAA as I saw it: the idea originated in the minds of the economic inventors; Wilson saw the problem coming years in advance; the idea was developed in consultation with farmers, farm leaders, dealers, and all others who would be affected or who had a contribution to make; and everyone felt that he had had a part in determining what should be done and how the program should operate [8, pp. 48–53].

It was anticipated that the agricultural adjustment program would take care of the problems of the efficient commercial family farms but that many other families needed a different kind of assistance. As soon as the AAA was established, Wilson transferred to the Department of the Interior to organize the Division of Subsistence Homesteads. After his return to the Department of Agriculture as Assistant Secretary in 1934, he continued to give increased attention to the problems of the "lower one-third" of the farm population.

The 1940 Yearbook of Agriculture, *Farmers in a Changing World*, contained an article by M. L. Wilson titled "Beyond Economics." The editors introduced Wilson's article in the following manner:

> An economist by training, the author of this article is a rural philosopher by nature. He holds that economics, and in fact most social sciences, at-

> tempt the impossible when they try to fit human affairs into neat little cubby-holes and make rigid rules according to which human beings ought to behave. Not reason but custom is the force men obey, he says, and the problem of adjusting agriculture to the modern world is basically psychological and cultural rather than physical and technological. But to admit these things is not to be unscientific; in fact the more scientific a man is, the more clearly he will see that our economic problems are really moral problems. On a foundation of these ideas the author builds a philosophy of agricultural reform. He deals especially with new possibilities for a better life for those whom we have been unable to fit into our economic system [11].

As Under Secretary of Agriculture, 1937–1940, Wilson, along with Secretary Wallace and others, gave attention to training public servants for effective functioning in a democracy. One phase of these efforts was a series of lectures and seminars in the department to explore the nature of the democratic process as distinguished from the ways of dictatorship under communism, fascism, and national socialism. Wilson's book, *Democracy Has Roots,* summarized this series of discussions. It illustrates his leadership in stimulating the employees of the department to perform their duties in accordance with the needs and spirit of American society [12].

From the time he first went to the Mayo clinic for treatment of stomach ulcers, Wilson was vitally interested in nutrition. Improper or inadequate diet seemed to him an important reason why many individuals and nations had failed to keep pace with the progress of others. One outgrowth of this interest came during World War II, when he was responsible for the nutrition programs of the War Food Administration. The British had found that increasing B vitamins in the diet, through enriched bread, was an effective way to help their people withstand the nervous tensions of aerial bombing. Through Wilson's efforts, the Millers' National Federation and other interested organizations in the United States initiated a program to require enrichment of bread and cereals in this country. This is only one of many ways in which Wilson's influence has been instrumental in improving the diet of the American people.

Interest and experience in development of farm people in the United States led Wilson to active participation in agricultural development abroad, starting with his trip to Russia in 1929. He traveled extensively throughout the world stimulating other countries to adopt the extension idea and methods. His knowledge of nutrition has been especially significant in the developing countries. He encouraged hundreds of students and officials in other countries to come to the United States for training and observation of our methods. He had a profound influence upon the program of the Ford Foundation and other international agencies. He encouraged numerous young friends and associates to accept foreign assignments and to prepare themselves in anthropology, the psychology of social change, and other subjects necessary for effective work with people of other cultures.

It has been suggested that I should include a few personal items to illustrate how M. L. Wilson influenced and developed the people with whom he came in contact.

I first saw him about 1912 when he arranged with one of the farmers in Wibaux County, Montana, to plant a field with different varieties of corn. When the corn matured, he had a field day to show farmers which varieties seemed best adapted and how the tall corn could grow in eastern Montana as well as in Iowa.

In 1925 I went to work for the new Department of Agricultural Economics in Bozeman, having just graduated in agronomy. Wilson was on leave with the BAE but was in Bozeman on a trip with Howard R. Tolley. He knew that I should get acquainted with Tolley, so he did two things. He told me to get Tolley to help write a project statement for a wheat marketing study which I was to conduct. Then he said, "Now, Ed, Tolley has never slept out, and if you were going to take Tolley and me out camping tonight, where should we go?" We only had the one evening, so the three of us went up Middle Creek, south of Bozeman. At that time we could get by car only a mile or so above the mouth of the canyon, but we did give Tolley a chance to see what it was like and, incidentally, to get Tolley acquainted with Ed Bell.

In the fall of 1926, on my first trip to Washington in connection with the wheat marketing study, Tolley called a meeting of his staff and had a seminar on the economic problems of Montana. In later years Tolley, along with Wilson, became one of my most valued friends and advisors.

In connection with the Fairway Farms operations, Wilson had many close contacts with the farm machinery manufacturers and particularly with Alexander Legge, president of the International Harvester Company. "Old Alex" offered Wilson a position with the Harvester Company at a salary several times what he was getting from Montana State, but Wilson declined the offer. I was recently asked what Mrs. Wilson thought about this, and the best answer I could think of was that Mrs. M. L. was also a philosopher. It is evident from reading Wilson's spiritual autobiography that his motivations were not financial. He was more vitally concerned with the problems of farmers and the welfare of the people [5].

During the Farm Board days I had a chance to ask Alex Legge about his offer to Wilson and what he would have had M. L. do if he had gone to work for the Harvester Company. Alex said, "Why, Bell, I was going to give M. L. an office right next to mine and tell him to go anywhere he wanted to, anywhere in the United States or the rest of the world, and pick up all the ideas he could find and come and tell me about 'em."

Two years ago a symposium was held at Montana State University when those who had served under Wilson in the Department of Agricultural Economics presented our views and recollections. These symposium papers will soon be published. In summarizing the symposium, Harold G. Halcrow made the following observations:

> The genius of M. L. Wilson stands out in a number of ways: his ability to perceive the course of great events, his vision of what would work in our democracy for the betterment of mankind, and his dedication and creative ability which inspired others to become dedicated and creative in the highest tradition of our profession. It has been said that one way to be a successful administrator is to select the most capable people that one can find and then get out of their way. M. L. followed the first part of this formula. But instead of leaving people alone, he helped give them a sense of direction through which they could fulfill themselves and in turn inspire others. Nearly all of us here and untold others have benefited directly from his inspiration. It has caused many to achieve far more than they might otherwise have done [8, p. 136].

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A 1960's Look at the 1930's Policy Proposals of M. L. Wilson*

George S. Tolley

IN terms of personal dedication, sacrifice, judgment, vision, and competence relative to alternatives proposed at the time, the performance of M. L. Wilson and other agricultural economists who participated in New Deal policy-making must be judged A+. Only a little thought leads one to feel that it would be difficult in the extreme to criticize or second-guess the decisions made at that time. The purpose of these comments is to take stock in light of events that subsequently took place, without implying that the future could have been foreseen better than it was.

M. L. Wilson's capacity for succinctness is helpful to an ex post commentator. In a national radio program in April 1932, he suggested a six-point approach representing breaks from the existing programs. In the six points can be discerned a foundation for the later attempts to modify policies affecting agriculture. Because the speech was made before the New Deal came into existence, it provides evidence on which of his aims were accomplished as well as on recommendations that were not fully carried out.

Three of the points concern efforts to encourage efficiency in agriculture. They were given most prominence, exhibiting concern for longer-run consequences even though there was a crisis atmosphere. The eye of the needle through which the efforts to encourage efficiency were seen to pass and be integrated was land-use planning. Up to today, land-use policy actions of the kind he advocated have been tried in some forms, even though they have not been the cornerstone of agricultural policy which he envisaged. Two other points concerned rural government and rural industrialization. Though still not the major part of agricultural policy as he recommended, in recent years these have become the focus of relatively more effort than in the 1930's. A final point was a proposal for a domestic allotment program, which was a new concept at that time and became the cornerstone of the New Deal agricultural policy.

The six points will now be considered in more detail. Regarding encouraging efficiency, one of the recommendations was for long-range planning and stated that "each state should classify its land, develop a state land-use plan, and institute a program of action." This would involve "surveys and studies of soils, topography, climate and records of past

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* The quotations are from M. L. Wilson, *Land Utilization,* Economics Series, Lecture 25, Chicago, University of Chicago Press, 1932. Correspondence with Elmer Starch was helpful in preparing these remarks.

George S. Tolley *is professor of economics at the University of Chicago.*

yields. Farm history, economic marketing, and farm management material should be brought up to date, to show the family incomes, standards of living, and status of schools." This concept of comprehensive and intensive consideration of the adjustments and potentials of particular areas influenced much subsequent economic research and planning. Analysis of the dynamics of change in the context of homogeneous type-of-farming areas, toward which the land-use planning recommendations pointed, has progressed since the 1930's. It remains an important need, which he started helping to meet.

A latter-day question is whether in retrospect the emphasis on land use, relative to employment of other resources such as people and purchased inputs, represented the most desirable balance. The action proposals regarding land use could have contributed significantly to long-run efficiency for agriculture, but by how much remains moot because they were not adopted on a large scale. The proposals were to repeal the Homestead Act, withdraw marginal lands from production, and institute the state programs to encourage land-use changes.

Rural industrialization efforts of the 1950's and the 1960's were anticipated in the proposals to encourage part-time farming and industrial decentralization, for existing full-time farm operators who would otherwise leave rural areas. This was justified then as now as a means of decentralizing to avoid congestion costs of metropolises leading to a more pleasing quality of life. The issues have remained very much the same. In spite of the increased emphasis recently, most of the support given to the idea has remained verbal, with some experiments but without putting strong comprehensive programs into effect.

One of the biggest pluses goes to M. L. Wilson's proposal for rural government reform, which reads like something partly from today and partly from some year that still remains in the future:

> Most of our local governmental units were created in the horse and buggy days. The telephone, automobile, and good roads have rendered many present governmental units too small, resulting in duplication, unnecessary expense, and inefficiency. In such cases consolidation of units and managerial forms of administration will make the tax dollar go much farther. The general property tax is likewise a carry-over from a simple society. Modification and change in our land-tax system, also a relic of by-gone times, are necessary before many improvements in land utilization can be effected.

The nation is still trying to update its local government structure, and the fiscal difficulties of local units together with malallocations caused by the property tax are increasingly of concern.

If there were one single thing that we could ask to be done again differently during the New Deal, a contender would be to have gone as far as or even farther than the foregoing far-sighted statement. During those times, when big changes in ways of doing things were contemplated, would it not have been helpful if differences in public services among areas could have been eliminated or at least reduced? Because of lower incomes accentuated by relative lack of traditional tax base, and because of higher costs associated with geographic sparsity of population, rural areas are particularly the butt of expenditure disparities. With the continuing emptying out of rural areas, concentrated in just those places which have already fallen behind incomewise, the disparities are becoming accentuated. It is truer and truer, therefore, that people remaining in rural areas are among those who would gain most from reform.

Worthy research would be to estimate what the country would be like if the differences in education and other government services between the New Yorks and the Mississippis were substantially narrowed. Reform would not need to entail complete federalization of educational finance but could instead provide a minimum support for every school child in the country. Communities would still be free to support education above these levels. Just as poor counties within rich states now receive support for education through state taxation, so they would receive support resulting from federal taxation. The introduction of widespread federal aid to education during the 1960's finally started to go in this direction but has not gone far enough, considering both the point of view of making economically productive investments in children and the point of view of evening out the opportunity differentials which are now leading to such serious social unrest and disorder. In short, M. L. gave a cue in his views on local government that still has not yet been followed nearly vigorously enough.

Beyond specific proposals for action, there is an implied challenge to develop principles to guide the search for an optimum structure of government. Which expenditures should be private and which public, and, among the public ones, what group of people (town, county, state, nation) should have responsibility for decision-making? There is promising work, based on the concepts of externalities and transactions costs, which throws light on criteria for optimum government structure if economic efficiency is the only goal. Less developed is how such criteria are modified in the light of income distributional objectives—recognizing that income distributional objectives are not easily deduced or easily obtained without efficiency costs. As the above quotation from M. L. Wilson about rural government indicates, the answer to what structure of government is desirable should not be to continue to live with what history threw up. Rather, he was pointing to a fruitful search for principles based on the purposes which government decisions can serve.

M. L. Wilson's view of the domestic allotment plan when he was advocating its adoption is instructive because he saw it neither as a panacea nor as permanent. As one of several evidences of his looking to possible cures from outside of agriculture, he stressed that "neither this [allotment plan] nor any combination of plans can be successful within a wobbling monetary system." He recognized with regret the protectionist effects of the allotment program and referred to it as "the policy of today," putting himself on record in favor of free international trade. "The combination of the best land in the world, highly mechanized farms, superior efficiency, and a high level of intelligence, I believe, would enable the farmers of the United States to compete on equal terms with any nation."

One might have advocated the allotment program even if one had known that it would last for over 35 years and would eventually be coupled with diversion payments whereby the U.S. Treasury has come to pay a large portion of farm income. The programs essentially accomplished their emergency aims and, regardless of shortcomings, have allowed agriculture to continue to contribute to the nation's progress through rapid technical advance.

As times continue to change, it will not be surprising if the allotment program does eventually prove to have been transient. It may not indefinitely be able to secure congressional support. Three alternative policies are (1) free markets, (2) present controls with high Treasury costs, and (3) producer group control of production and entry without government subsidy. The third alternative is increasingly being considered by those concerned with farm policy. Given the disruptions accompanying rapid technical change in an industry characterized by extreme inelasticity of short-run demand and supply, the third alternative has much to recommend it over trying completely free markets. It is democratic in the way that M. L. Wilson favored of involving farmer participation in decision-making. It could accomplish the much-needed job of taking farm policy out of politics and out of its demands on the taxpayer.

With producer control programs, the extent to which society's (especially consumers') interests are represented depends on types of control permitted and on the limits set on producer group actions. Professional agricultural economists are especially equipped to design programs with these considerations in mind, because of their technical competency and because they bring less of a special-interest point of view than most others concerned with farm policies. Unfortunately, there appears to be less inclination of professional agricultural economists to help devise changes in agricultural policy than there was by M. L. Wilson and others of the profession in the 1920's and 1930's. One of the greatest benefits from reviewing what M. L. Wilson contributed is to be reminded of the need for agricultural economists to contribute more to agricultural policy-making, in the spirit that he has done, which is a spirit rare today.

It will be remarkable if the next generation is able to give the present generation as good a grade as the present generation must give to the preceding one.

COMMUNITY FACILITIES AND SERVICES

CHAIRMAN: JOHN H. SOUTHERN, ECONOMIC RESEARCH SERVICE, USDA

Community Facilities and Services: An Economic Framework for Analysis

LEE M. DAY*

I SHALL begin this paper with the observation that a nation of generally wealthy and prosperous individuals finds itself relatively poor with respect to public goods. We also find communities of poverty within our midst—communities where many public services are either lacking or of a disgraceful quality. Faced with this kind of situation, the arguments for additional expenditures are vague expressions of need, and the arguments against follow the theme that in spite of all our wealth we simply cannot afford additions to the public sector.

Economists generally, agricultural economists in particular and administrators in the USDA–land-grant university system must bear a large part of the responsibility for this lack of more definitive knowledge. It is astonishing that agricultural economists should know so much about how to produce or how to control the production of feed grains, wheat, and cotton and at the same time know so little about the way people live or the costs and effects of improving the manner in which they live. Some notion of our priorities can be gained by a perusal of the "Long Run Research study" and noting the recommended increases in scientific man-years[1] devoted to people problems as compared to production problems.

It is my contention that our priorities reflect the critical issues of a day long since past and that although some progress is being made in the rearrangement of our priorities the rate of progress is far too slow.

I choose to define the problem of community services as one of public goods or services. Further, I accept as a definition of a public good[2] that which meets at least one of three conditions: (1) jointness of supply (that is, consumption of the good does not preclude its consumption by others: the lighthouse is a classic example), (2) existence of external effects which accrue to other persons or communities and for which it is infeasi-

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* I am indebted to my colleagues, Dean Jansma, Burl Long, and Wayne Schutjer, for helpful suggestions.

[1] Not the percentage increases, for a 200-percent increase from virtually nothing is still virtually nothing.

[2] There has been considerable controversy about the characteristics of public goods. See Buchanan [4] and Samuelson [14].

LEE M. DAY *is professor of agricultural economics at Pennsylvania State University.*

ble to compensate either by subsidization or by taxation, and (3) production of the good by a decreasing-cost industry such as is generally thought to be the case with public utilities.

Clearly, "public goods" is not synonymous with the current public provision of goods. As the society develops, solving old problems and creating new ones, the list of public services will continue to grow. For example, I believe it can be demonstrated that either the creation of a slum condition or its improvement has external effects for which it is infeasible to compensate. Thus, it is important to note that public goods may have negative as well as positive values. If a new industry enters a city which is already at the low point on its average cost function, and it is infeasible to charge this new industry the full marginal costs of additions to public services, as well as other social costs such as congestion, then at least some aspects of the industry might be thought of as a public good, albeit of negative value.

In dealing with public goods and services, as in all other areas of economics, we must continually search for new alternatives—alternatives which will make the community a better place in which to live and which will achieve this objective at the lowest possible cost (other things equal). Often this search for alternatives will reveal that preventative action will be cheaper than correction after the event. This will, I believe, inevitably lead us beyond the traditional view of public goods and services. The area of research in public services will include, in my view, such things as an analysis of alternative mechanisms for the direction or redirection of migration, an appraisal of "new town" or "rural growth center" proposals, and an analysis of the total human environment, as well as the more traditional public services.

Having thus sketched a tentative outline around the area of community services, we must now turn to the question of what an economist can do to bring more relevant information before the decision-makers—decision-makers at all levels—national, state, local, and, most important, the individual citizen.

I would presume that all of us would desire the specification of a model which would permit a determination of the optimum distribution of resources between and within the public and private sectors. But this is not a simple task. We are faced with a multiplicity of objectives—economic growth, a reasonable level of stability, the elimination of poverty, and an even greater number of subobjectives, such as better health, better education, better communication, better housing.[3] Unfortunately, we do not know the weights or priorities to attach to these objectives. More importantly, we are lacking the ingredients by which an intelligent society can rationally arrive at the appropriate weights to be attached to alternative objectives. What will be the effects of increased expenditures, or alternative types of expenditures, for education at the level of the local, state, and national community? How do these effects compare with expenditures for other public services or with the use of these same resources in the private sector?[4]

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[3] "Better" or "more effective" may refer to a measure of aggregate quality and availability as well as to the distribution of the service between geographic areas and among segments of the population within an area.

I observe that the interest in community services centers around two objectives: welfare (for example, better education as a means of improving the quality of life) and economic growth and development. Therefore, I presume that the basic framework for the analysis of community services is a cost-effectiveness analysis of alternative means of achieving these objectives. Insofar as we are not likely to be able to estimate the specific weights to attach to the growth or welfare objectives or, for that matter, to such subobjectives as improved health, police protection, and sanitation, we will have to be content with suboptimization [8]—the analysis of cost-effectiveness of alternative means of achieving a specific subobjective. The structuring of this analysis follows the familiar patterns of iso-factor, iso-cost and iso-product curves, the economies-of-size concept, and the various theories of economic growth. Further, we must be concerned not only with aggregative measures but also with the distribution of costs and benefits over space and among people. Therefore, in the remainder of this paper, I will address myself to specific problems in the application of these concepts. In doing this, I will draw heavily on the work of urban economists. It appears to be appropriate to discuss these problems under two headings: (1) costs and outputs and (2) evaluation of outputs leading to cost-effectiveness analysis of alternatives.

Costs and Outputs

The recent attention given to the problem of the urban ghetto and its counterpart, the rural slum, has raised the question of rural-urban balance. Are some of our cities too big and our towns too small? Is there such a thing as an optimum-sized city? What are the criteria for judging optimality? Would it be cheaper to direct migration to new or smaller cities than to reconstruct large portions of our metropolitan areas?

There are indications that areas of larger population spend more per capita for education, highways, public welfare, hospitals, police and fire protection, and sewer and water systems. Shapiro [15] in a study of expenditures of local governments found evidence of a U-shaped pattern in local government expenditures, with high per capita expenditures in both the smallest and largest communities. Barlowe [2] arrived at similar findings, using 1962 data. But these studies are not really indications of economies and diseconomies of size. Two considerations are important: (1) the quality of service has not been held constant across all sizes, and (2) the use of per capita figures may permit some distortions. Particularly for such services as hospitals and education, the number actually served would be expected to be a function of the age distribution of the population.

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[4] It may very well be that many of the most important effects of expenditures for public goods are outside the range of expertise of the economist: for example, the improved citizenship ability associated with better education or the higher aspirations of a child in a family moved from a slum to a public housing project. But it would appear not unreasonable to expect economists to study economic impacts of expenditures for public goods and to collaborate closely with workers in other disciplines to trace out, describe, and evaluate other impacts of such expenditures.

Hirsch [6] has called quality the economist's stepchild. Some may question whether the relationship is really that close. But the sparse history of research on quality does include some pioneering work in the 1920's by such agricultural economists as Fred Waugh [17]. More recently, in the field of community services, Riew [13] studied economies of size in high school operations in Wisconsin. Riew recognized the need to include quality of education in his analysis. This was accomplished by three procedures: (1) limiting the observations in his sample to those schools which were accredited by the North Central Association, (2) eliminating those schools with exceptionally high teacher salaries, and (3) including in his cost function such quality indicator variables as average teacher's salary, number of credit units offered, and number of courses taught per teacher.

Riew found that, holding other variables constant, increases in enrollment from 200 to 500 students reduced costs over $95 per pupil, and increases from 500 to 1000 reduced costs $111. Although Riew's coefficients appear reasonable, he did not measure quality. One cannot escape the conclusion that studies which do not measure the quality of service, even though they contain some "quality" variables, are likely to be neither a study of the economies of size nor the economies of quality. Like it or not, we cannot study the economies of size without studying the economies of quality, and I suspect that among the users of economic information there is more interest in the economies of quality than in those of size.

In some instances, the joint study of the economies of size and quality will represent little difficulty. Hirsch in his study of refuse collection [7] identified two aspects of quality—convenience to the individual household in terms of frequency and location of pickup, and the community facet in terms of the method of treatment of the collected refuse. He then proceeded to estimate a single cost function, utilizing a combination of continuous and zero-one or dummy variables to isolate size and quality effects on cost. His empirical results insofar as they did not indicate a significant size effect are open to question, and one might want to improve his estimating procedures, funds and simple size permitting; but his basic approach is commendable.

In other well-defined activities such as sewage treatment, the quality of output for a given treatment plant may have so little variance that stratification by type of plant may be tantamount to stratification by quality. If this is the case (it needs to be tested), then much can be learned about the economies of quality by simply comparing the alternative cost functions. There is considerable evidence of economies of size in sewage treatment. For example, construction costs per capita on an Imhoff tank plant to serve 100,000 people may be about one-tenth the costs of a plant to serve 1,000 people [16]. Further, per capita costs of operating a primary sewage treatment plant are estimated to be $58 per million gallons for a million-gallon capacity facility as compared to $8 per million for a 100-million-gallon plant [1]. Such economies suggest the alternative of multiple villages in close proximity using a common treatment plant.

In other services, such as education and medicine or hospitals, quality measurement may be a very difficult task. The New York State Department of Education undertook in the late 1950's an ambitious project—the measurement of the quality of education in the public schools. Kiesling [9] in his report on the project recognized a broader range of objectives of education than achievement of basic skills, but the analysis of quality of output was limited to academic achievement in the basic skills. Using achievement as measured by the Iowa tests of basic skills as the dependent variable, he fitted a regression with five independent variables: (1) pupil intelligence as estimated from the Lorge-Thorndike Intelligence Examination, (2) socioeconomic attributes of the community in which the school was located, (3) expenditures per pupil, (4) the size of the school as measured by average daily attendance, and (5) the past rates of school district growth. Kiesling found little relationship between output and size of school, although there was some indication that, as size increased, quality or output decreased. Further, he noted that schools with high expenditures per pupil tended to produce higher achievement among the more intelligent students, thus raising another facet of quality, achievement by different segments of the student population.

The Pennsylvania Department of Public Instruction [11, 12] is building on the New York project in a most ambitious study of quality assessment. This study, now in the pilot stage, will emerge as a full-grown effort in 1969. The advisory committee conceived the major objectives of the educational system, ranging from achievement in the basic skills, through health habits, vocational development, self-understanding ,and citizenship training, to such other aspects as readiness for change and creativity. With the assistance of the Educational Testing Service, they developed measurements of achievement for each objective. Input variables were divided into three classes: (1) student and family related, (2) community, and (3) school and staff inputs. The 7 student inputs in the pilot study include such variables as race, student IQ, and educational and occupational background of parents. The 4 community inputs include location (rural, suburban, urban), trends in population, type of housing, and an effort index (taxes collected relative to market value of property). Special attention is being given to school and staff inputs, with the 23 variables in this class ranging through such traditional variables as teacher educational background, age, and experience, support personnel, guidance personnel, to such other variables as teacher aspiration and willingness to try new innovations.

I do not wish to prejudge the 1969 effort, but is is apparent that a definition of quality based on ten objectives of the system poses difficult problems. Even if the measurement of achievement on each objective is sufficient to support a three-step rating, high, medium, and low, there are 3^{10} or over 59,000 possible definitions of quality. Clearly, the analyst must either limit himself to a few of the more common definitions (definitions which are satisfied by relatively large numbers of schools) or attach weights or alternative sets of weights to each objective to obtain a simple standard of quality. Since we have no basis for a cost allocation between objectives, and certainly no basis for determining the costs of different levels of achievement of each single objective, the former alternative seems most appropriate as a starting point.

The formulation of the Pennsylvania study provides considerable flexibility of analysis. Think, for example, of estimating achievement in the following manner.

$$X_{1L} = f\ (X_{2i}, X_{3c}, X_{4s}),$$

where

X_{1L} is the raw academic achievement score, given a specific level of achievement of alternative educational objectives ($L = 1, \ldots, n$),
X_{2i} is a set of student-related characteristics ($i = 1, \ldots, n$),
X_{3c} is a set of community-related characteristics ($c = 1, \ldots, n$), and
X_{4s} is a set of school-related characteristics ($s = 1, \ldots, n$).

The estimation of this equation would provide the means of adjusting the academic achievement scores for differences in students- and community-related variables.

Next, in the development of a cost function, we would be faced with two alternatives: (1) utilizing the adjusted academic achievement scores, or (2) treating quality as a continuous variable. With the small number of observations likely to result from the necessity to hold achievement of other educational objectives constant, the continuous quality variable seems most appropriate. Thus, we could think of estimating a cost function as follows:

$$C = f\ (X_{1L}, X_{48}, X_5),$$

where

C is total operating costs of the school[5] and
X_5 is size as estimated by average daily attendance.

Neither space nor my own competency allows a detailed discussion of the costs and outputs of each of the various community services. So I would like to conclude this section of the paper with a few general observations:

1. The usual per capita measures of costs or expenditures for public services are of questionable value because the clientele served is not always the total population or because the need for the service is a function of the characteristics of the population.
2. The output of a community service is represented not only by the people served but also by the quality of the service. In many instances, particularly in the areas of police protection and health (both physical and mental and both preventive and corrective health services), quality measurement will require the fullest cooperation with disciplines other than economics.
3. Quality of service may not be the same for all segments of the population, either because of characteristics of the service itself (for example, differential treatment of high-capacity and low-capacity students) or because of the objectives of the clientele served (for example, vocational versus academic education).
4. If our objective is to minimize costs of a specific quality of service, we must include private as well as public costs. Thus, in such services as transportation, commuting time of the citizens needs to be given as much attention as construction costs. That is, we must be as much concerned with cost's shifting from the public to the private sector as we are with its shifting from the private to public.
5. We need to recognize and estimate the interrelationships between services. For example, a part of the output of increased expenditures for recreational facilities and programs may be a reduced expenditure to achieve a given level of police protection.

Evaluation of Outputs

Decision-makers at all levels—local community, state, and national—are prone to desire some evaluation of the output effects of expenditures on community services, although for centuries they have acted largely on faith or in response to crisis. I do not wish to denigrate acting on faith, for they may have to do so for a long time to come. How can you really measure the value of security of employment, or the esthetic value of beautiful parks, or the city symphony, or the value of a life saved, or the citizenship of a well-informed society? We may never be able to measure some of the real values created by public services, but we can reduce somewhat the area of uncertainty. At least, some reasonable estimates can be made of the economic impacts of some of the public services.

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[5] For a discussion of the accounting problem and costs to be included and excluded, see Riew [13].

Carroll and Ihnen [5] have studied the individual costs and returns of attending a two-year post-graduate technical school in North Carolina. Others have studied the incomes of individuals as related to the number of years of education.

In some cases guidance to expenditure decisions can be developed from estimates of the cost of inaction. Although many might argue about the incidence of taxation, few would disagree that a community which suffered a $10-million loss in a race riot would have been better off to spend $10 million to correct the causes of a riot. Or think of the loss of income tax revenue and the welfare costs of the currently unemployable, or the loss of productivity that could have been maintained with adequate health services, or the gain in productivity that is thought to be associated with a better-educated labor force.

It may be helpful to think of the task of evaluation as consisting of two parts: (1) determining the potential economic impact of improvement in community services, and (2) estimating either an expected value or the probability of achieving alternative portions of that potential.

The effect of some community services, particularly health and educational services, is to improve the human agent—better health services should produce healthier people, with less time off from productive activity. Better-trained people should mean a more productive labor force, a labor force that can conduct a given task more effectively and one that performs tasks that are impossible for a less-trained labor force.

If such effects can be estimated, possibly by comparing areas with different qualities of services, then we should be able to estimate the potential impact of such a quality improvement through an "adapted" input–output model for the local area, state, or nation [3]. This could be accomplished in either of two ways: (1) an iterative approach, or (2) the conversion of the input–output model to a linear programming model. In either case, a bench mark could be provided by a solution to the input–output model. Knowing the labor associated with a unit of output of each sector, and given the productivity characteristics of the current labor force, one could "blow up" the final demand to provide some minimum level of unemployment. Next, one could increase the effective labor supply to the extent indicated by a specific quality improvement of health services (as estimated by the interarea comparisons) and expand the final demand to provide the same minimum level of unemployment. Comparison of the two solutions would then provide an estimate of the potential gross product impact of investment in improved quality of health services. Clearly, similar estimates could be achieved for investments in education, and comparisons could be made of the cost–effectiveness of investments in health and education. Further refinements could be included, such as the effect of improved quality of education on productivity of each sector of the input–output model rather than an improvement of the aggregate work force.

An alternative computing procedure would be to correct the input–output model to a linear programming model subject to equal-to or greater-than constraints for the final demands, equality constraints for employment of labor, and other constraints to insure that the mix of the various sectors would remain within some upper and lower bounds. The weights or prices in the objective function could be unity or the relative proportions of each sector in the current final demand.

But not all public services act directly on the human resource and not all of the potential GNP impact of the improvement in quality of education and health is likely to be realized. So we must search for some other means of analyzing the economic impacts of alternative investments in the community services area. I would presume that one of the major considerations with respect to investment in community services in many rural areas is the influence on growth or, more specifically, the effect of the availability of alternative qualities of public services on the probability of different levels or kinds of growth. Clearly, a probability estimate could be used to discount the potential impact on an "expected value." But, more importantly, such ideas illustrate the possibility of using simulation models—models in which events are drawn from a set of probability distributions and later decisions are, in part, a function of the earlier events, thus simulating the development processes. Repeated simulations could then give you a probability distribution of outcomes for a given period and for a given set of investments in community services. Comparisons of the distribution of outcomes for alternative sets of investments could then provide some insights about the appropriate mix or magnitude of investments in community services. Clearly, the key to this type of effort is the development of the probability distributions. One might think of estimating the probability of a given type and magnitude of growth, measured in terms of income or employment, as a function of a set of population characteristics including age, special skills, and education; a set of community characteristics including such variables as the availability of alternative qualities of each of several public services; a set of natural resource characteristics; and a set of variables reflecting the current mix of industries in the area. Empirical estimates of such a function could be based on cross-sectional data for a recent period.

Finally, I would suggest that some modification of the Maki *et al.* model [10] will prove to be useful as a simulator of the effects of alternative investments in community services. This model uses the inverse of the Leontief matrix as one of 50 major equations.

Thus far we have paid little attention to the interrelationship among objectives and the multiproduct output of particular lines of action. The situation may be complicated by the fact that alternative lines of action may produce a different product mix. For example, alternative road construction activities might require different levels of patrol activity and create different recreation opportunities. Think of an integerized cost-minimization model for a state or region in which the activities are alternative means of achieving each of a number of objectives. The cost for each activity is the sum of private and public costs. The constraints are (1) a series of equal-to or greater-than statements of output for each objective (these may include distributional constraints—minimum levels of output for specific segments of the population such as the poor), and (2) budgetary constraints for each of several levels of government. The internal coefficients reflect the effect of each alternative activity on the constraints.

One could further complicate the problem by a consideration of time. For example, a particular education activity in a rural area may influence welfare costs in an urban area ten years hence.[6] By variable resource mapping of the constraints, one could present to decision-makers various combinations of outputs, some of which might be valued in dollar terms and the list of specific activity levels and costs which would be associated with each combination of outputs. The decision-makers could then use their judgments of the values or weights to be attached to each objective, knowing the costs and other impacts of choosing a particular combination of outputs.

Clearly, we are a long way from being able to provide decision-makers with the results from this and other models. But the future of research in the area of community services promises to be an exciting one, filled with small successes and great frustrations.

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Discussion: Community Facilities and Services: An Economic Framework for Analysis

JOE B. STEVENS

Professor Day's paper may be divided into three parts: (*a*) a definition of community services and facilities, (*b*) consideration of optimization versus suboptimization in economic models, and (*c*) a review of selected current and proposed research topics. I would judge the last to be the most useful of the three parts, although I find it difficult to discuss a review of selected literature. Declaration of sins of omission is not quite cricket, and

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JOE B. STEVENS *is assistant professor of agricultural economics at Oregon State University.*

sins of commission are not readily evident in his assessment of the research which he has selected to discuss.

The problem of providing community services and facilities is equated by Day to that of providing public goods and services. He is appropriately careful in pointing out that the category of public goods is not synonomous with the current provision of public goods. In addition to evaluating traditional community services, we are also encouraged to consider alternative mechanisms for directing migration and the location of population growth centers. Viewed in this light, the evaluation of community services takes on some new and exciting dimensions.

With regard to criteria for policy, the author asserts that we are faced with a multiplicity of objectives for which social weights or priorities are not known. He contends, therefore, that we must be content with suboptimization. The basic analytical tool which is suggested for this purpose is cost–effectiveness analysis of alternative means of achieving the subobjectives.

In discussing the influence of quality factors on the nature of cost functions for public services, Day identifies a crucial element. He points out that empirical attempts to test for economies of size must ultimately face the question of whether or not the services being compared are, in fact, comparable. Our traditional orientation to homogeneous groups of agricultural commodities needs considerable revision as we begin to do empirical work on public goods and services. Suffice it to say that the economist will no doubt have to stick his neck out when he attempts to measure the quality of public goods. The risk, however, may be more than outweighed by the benefits derived from even partial measures of quality, if they are recognized as such.

Having attempted to extract the highlights of Professor Day's paper, some comments on the total effort may be in order. If one is to judge the total effort as to whether or not it lived up to expectations aroused by the title, some degree of disappointment must be expressed. The suggestions which he makes on methodological techniques are interesting and relevant but I would argue that the opportunity costs in terms of slighting the theoretical framework are quite high. To my mind, it is insufficient to conclude that it is utopian to try to optimize and that we must therefore settle for a suboptimum. An obvious limitation is that a "suboptimum" may be as elusive as the "optimum."

Having thus advanced, let me retreat somewhat. It is not that my criticisms relate to the validity or correctness of the theory implied by the author. Economies of size and input–output relationships between economic aggregates have a legitimate place in the theoretical framework. I would argue, however, that intrafirm and intersectoral conceptualizations fail to enable the economist really to come to grips with problems of public goods and services. Lest this be construed as an objection solely against Day's treatment, it is more general than this. In spite of the literature on externalities in general economics, the *AJAE* has had very few leading articles which have attempted to apply this literature to our problems. A notable exception is that of Castle's article on "The Market Mechanism, Externalities, and Land Economics" [2]. I would argue that this is the body of theory which must form the core of our framework for analyzing the role of the public sector; continued neglect will perpetuate the orientation of our profession to the firm, to market transactions, and to the agricultural sector. I would not argue that we should abandon this role, but only that we have real contributions to make by going beyond it. If one prefers, these contributions can be within the agricultural sector; our continued neglect of the human resource and the rural community was charged by Bishop [1] in last year's presidential address. If these contributions spill outside agriculture, so much the better, in my value framework. I suspect that the marginal social productivity of the agricultural economists could be quite high in the areas of urban housing, urban education, and urban transportation.

As a final argument, let me make an appeal to authority. George Stigler has written this: "The economic role of the state has managed to hold the attention of scholars for over two centuries without arousing their curiosity. . . . Economists have refused either to leave the problem alone or to work on it" [3, p. 14]. Stigler did not direct this blast at Professor Day's paper, nor do I. It might better be directed, in fact, at my own comments, since Stigler argues that we now have the quantitative arsenal to put economics at the threshold of its golden age. To further diffuse the blast, he may be quoted as saying: "It will become an occasion for humorous nostalgia when arguments for private or public performance of a given activity are conducted by reference to the phrase, external economies, or by recourse to a theorem on perfect competition" [3, p. 17]. Stigler is pointing out, of course, the general ambiguity of *a priori* theoretical models with respect to public policy. I would argue that because of this ambiguity, the crucial empirical work such as Professor Day suggests may be more judiciously arranged in an appropriate theoretical context. Welfare theory suggests the hypothesis, but not the fact, that public intervention and/or public investment may give results superior to those generated in the market. The quantitative arsenal of the economist can then be unleashed on the problem in the broad context of social benefit–cost analysis.

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Community Health Facilities and Services: The Manpower Dimensions[*]

DAVID S. BALL AND JACK W. WILSON

MANY people believe that the quality and quantity of health services provided in the United States are inadequate and that the distribution of these services is not the most preferred. These beliefs are expressed in discussions of the "doctor shortage," and in adverse comparisons between infant mortality rates (*inter alia*) in the United States and elsewhere. Advocates of the expansion of medicare and medicaid are arguing for more preferred distributions of health services among persons. The public believes that economists know that one basic cause of the "shortage" is the operation of a large collective monopoly that restricts entry into medical practice and enforces price discrimination. But public dissatisfaction with health services would not be eradicated solely by increases of professional numbers.

We discuss possible sources of the "shortage" and how their role might be assessed. Previous research, with a few brilliant exceptions,[1] slighted the spatial variation in rates of training, practice, and quality of service available across the nation. We have begun analysis of this variation. Our objectives are a better description of this variation and a better understanding of the operation of markets for health services.

In a perfectly competitive economy, the judgment that the quantity and distribution of a certain commodity are inadequate can be interpreted to mean that there is a different, better distribution of purchasing power. The judgment is supplied on extra-economic grounds, and the preferred distribution is achieved by ideal taxes and transfers that do not impair optimality. Its consequences are the reallocation of resources to the production of greater quantities of the commodity judged to be deficient, and the reallocation of consumption toward the commodity.

Could such a redistribution of income remedy the expressed dissatisfaction with the quantity and distribution of health services? Not entirely, because of the characteristics of the demand for and supply of health services.[2] Many premature deaths and medically unncessarily long illnesses of the poor could have been avoided if they had had greater pur-

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DAVID S. BALL *is associate professor of economics and* JACK W. WILSON *is assistant professor of economics, both at North Carolina State University.*

chasing power in previous periods. The lot of those who will be sick in the future *because* they are poor could be improved by a redistribution of income. Nevertheless, there would emerge, ex post, a group of medically indigent that would be little smaller than if the redistribution had not been accomplished. The medically indigent group will emerge in any case, because not all health risks are insurable. Not only is the future incidence of disease uncertain for individuals, but also for many the costs will be very large relative to the individual's income even in a more egalitarian economy. Some disease is predictable for large groups; hence, some risks can be shared through institutions that transfer specific purchasing power from the ex post well to the ill.

If all potential risk-bearing services could be purchased in the market, a redistribution of income regardless of health status could suffice if society agreed to ignore the lot of those who proved ex post to have underinsured. K. J. Arrow argued that it is unlikely that all potential risk-bearing services would ever be marketed. Their number is very great, for "the relevant commodities include . . . bets on all possible occurrences in the world which impinge on utilities" [4, p. 945]. That few will be marketed is affirmed by the high administrative costs of the risk-bearing services that *are* marketed and by the difficulty of distinguishing between avoidable and unavoidable risk.

With only incomplete health insurance available for purchase, after a redistribution of income that would enable all to buy available health insurance and to consume necessities at a level that would prevent poverty-induced illness, the medically indigent group would be composed of two parts, those who chose to bear risk instead of insuring, and the "deserving" indigent who would have bought some presently unavailable class of insurance that would have covered the events that befell them.

Unshiftable uncertainty so influences the individual's demand for health services that a major component of the purchase of professional care is information. A complete price-list for risk-bearing services would reduce, but would never eliminate, the information component. If the individual decides that he has purchased too much, it is often on the basis of information unavailable at any price ex ante. He is advised in purchasing decisions by the vendor of the services, the physician; and if he is insured for some part of the cost, the vendor certifies to the insurer the existence of the condition and the performance of the service. The three roles

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Carolina State University and from additional discussions with many helpful colleagues.

[1] Even in some of these, very large markets (states, in Friedman and Kuznets [12], cities in Rimlinger and Steele [21], or urban-rural residence in Andersen and Anderson [3], have been the units observed.

[2] We have benefited from, and draw heavily on, K. J. Arrow's analysis [4].

of the physician, as vendor, counselor, and expert witness, mean that there is great "moral hazard" in his practice. It is especially difficult to distinguish between avoidable and unavoidable health risks, because both the client and the vendor influence the chance that an insured service will be performed. These facts form a basic argument for professional ethics. They also cause the administrative costs of health insurance to be high and the range of insurable health risks to be narrow.

Simple income redistribution would not prevent the emergence of a new (though smaller) group of medically indigent. We might expect to be told that the quantity and distribution of health services are still inadequate. This can be interpreted as a call for a third income transfer, to those suffering uninsurable losses (the first was to the poor, the second was from the insured well to the insured ill). If the third transfer is not made, the sentiment that there is a shortage of health services will persist. The source of this shortage is deficient demand, not supply restriction.

It is difficult to observe this shortage in the market. Because evidence of collective monopoly can be obtained, its contribution to the shortage has been emphasized. Drawing on a rich historical record, Reuben Kessel [16] has written a persuasive indictment of collective monopoly; but where can the greatest welfare gains be made? Future research should assess the contribution of uninsurable losses to the "shortage."

The consumption of health services by some individuals benefits others; the classic case is immunization. Health research has some public-good characteristics and is produced jointly with medical education and service. Other health services are even more clearly public goods, for example, malaria eradication. Where economists have calculated costs and benefits of such programs [6] and services of the indicated level are not provided, there is shortage of health services in this sense, again on the demand side. If the public desires additional transfers from the well to the ill, and if there are unsatisfied demands for public health programs, market demand will be less than ideal demand with the transfers and additional programs.

Previous analysis of the "shortage" of health services has emphasized the supply and income of physicians. Friedman and Kuznets [12] found that a physician's income was higher than a dentist's by an amount that was greater than could be explained by the physician's more costly and lengthier training period; assuming that dentists had the same potential for practice that physicians had, the excess of the physician's income over the equilibrating difference between the two incomes was interpreted as evidence of restriction of entry into medical practice. Their case would be more persuasive if it could be shown that the physician's excess income persisted over periods during which the demand for physician's services was not increasing at a faster rate than the demand for dentist's services.

The supply of professional manpower is inelastic in the short run, even if there is no restriction of entry; there is little arbitrage between existing physicians and dentists. Neither enters the other's field in response to widened wage differentials. If the demand for physicians' services increased more rapidly than the demand for dentists' services for some time, we might observe an apparently permanent excess income of physicians. It would be difficult to distinguish the evidence for "dynamic shortage" from the evidence for restriction of entry.

Participation in health insurance has been rising for many years, and personal income increases almost continuously; both trends have tended to increase the demand for physicians. Because few have ever had dental insurance, the increased demand for dentists is due mainly to the increase of personal income. The income elasticity of demand for dental services would have to be considerably larger than its value for physicians' services to outweigh the demand-increasing effects of wider health insurance coverage.[3] Hence, it may be difficult to find a period in which the demand for physicians was not increasing more rapidly than the demand for dentists.

If collectively enforced price discrimination has been widespread, one response of the individual physician (especially the new entrant who observes that established physicians have captured a higher proportion of affluent patients than he can hope to obtain in his practice in the near future) to the fixed fee schedule is to use greater proportions of other factors of production to enable him to increase his case load. Over the long run, the effects of these alternative modes of competition may have been very important in increasing the effective supply of health services to the public. One effect is to erode the opportunities for price discrimination by increasing the proportion of total cost that can be assigned a standard cost. Somers and Somers [24, p. 53] report a declining importance of price discrimination. Of course, compared to competitive equilibrium with free entry at any point of time, there is an overallocation of resources to nonphysician factors and an underallocation to the physician component of health care. And the use of higher proportions of other factors of production probably has increased the optimal scale of the health service firm over what it would be under competition with free entry. The health service firm serves a local market, but the physician is geographically mobile. In small markets the cost of service will be high, or the service will be limited or nonexistent. An effect of the larger optimal scale, then, is even greater variation in the quantity and quality of health services across communities.

Another measure of the shortage of physicians is the comparisons of the rate of return that equates the present value of the expected earnings stream with the expected costs stream of one profession, with the rate of return for another. Lee Hansen found that the 1956 rate of return to dentists was 4 percent higher (not percentage points), and the rate of return to physicians was 10 percent higher, than the rate of return (11.6 percent) to male college graduates [13]. The higher rate of return to physicians may be interpreted as evidence either for a "dynamic shortage" in a still-adjusting market or as evidence of restriction of entry below the numbers that would present themselves for training at current costs and expected returns. Evidence for dynamic shortage is Hansen's finding a lower rate of return to physicians than to male college graduates in 1939; however, the 1949 rate of return to physicians and to dentists was equal and was 16 percent greater than the rate of return to male college graduates (11.5 percent), so that the return to physicians was greater in both of the postwar years examined.

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[3] This is not a complete analysis; for example, constant state of the art and product mix are assumed. It is intended to convey the difficulty of inferring restriction from relative wages at particular points of time. See especially Arrow and Capron [5] and Blank and Stigler [8].

If we do assume that the 1956 physician's rate of return was an equilibrium value, restricted entry is not the only potential explanation. Rates of return can serve only as proxies for the expected utilities of different income and cost stream combinations to which the individual responds. Both the longer training period and the meager early though sharply rising income stream of the physician, such that he receives a higher proportion of his dollar income in later years, distinguish his career from that of the male college graduate. Equal rates of return need not imply equal expected utilities from alternative careers and absence of restriction of entry if ideal credit and insurance are unavailable (for insights on this point we owe much to Loren Ihnen). If a student at the threshold of each career could purchase insurance on his professional success and could borrow substantially against his future income, he could modify his consumption time-pattern in professions with peculiar income streams to closer resemblance to the consumption time-patterns of other careers. Equal rates of return would more nearly imply equal expected utilities from alternative careers; and a higher rate of return in one career could be evidence of restricted entry. But professional insurance is unlikely because of the problem of distinguishing between avoidable and unavoidable risk in training and performance, and whether for economic or constitutional reasons, an individual can borrow only a small fraction of his present value.

The demand for health services deserves analysis in the total context of household behavior, the choice of work, residence, consumption, and investment in education and health, because there is interaction between each of these and future earnings and demand for health services. Gary Becker has expanded the theory of household behavior by integrating the neglected dimension, time [7]. This approach should be applied to health economics not the least because the use of health services is time-intensive compared with many other activities. Becker's household allocates time between earning money wages for the purchase of market commodities, and the inputs of time and market commodities required in the household production of goods that yield final utilities. The resource budget of the household might be thought of as the equivalent of the money wages that could be earned if the only hours of rest were the same that a rational slave-owner might allot. Any hours not spent at work for money wages above this minimum are inputs in the production of final goods in the household. Suppose that insurance schedules lag equilibrium prices, or that physicians maintain average fees below the equilibrium level (suppose they serve many poor at very low rates). Then there will be excess demand for service at the average level of fees that will disappear only when waiting time is sufficiently long. Time serves to ration fixed supply when there is excess demand at fixed prices.[4] Fees comprise the physician's income, but the client's outlay is the fee plus time in waiting and in care. The physician's rate of return could be little greater than that of other professions, yet there would be public sentiment, generated by the excess demand for quick service at the average fee, that there is a shortage. Access to service with less time cost would increase observed demand at current fees, and an increase in the number of physicians would not reduce their average income. Price discrimination can emerge as those who are willing to pay a higher fee for reduced waiting time do so.[5] This is not always the same as the price discrimination based on income or ability to pay that the profession allegedly follows. A working mother might buy a place in line ahead of the more affluent housewife, for example.

Health insurance compensates according to scheduled rates those who needed and obtained health services. In effect, the insured event is the treatment. Those who predecease care receive nothing, and those whose suffering is prolonged, or who are crippled by the delay of care, receive no compensation for the delay. If the average fee is below equilibrium, these extra waiting costs are imposed on the individual and are uninsurable.

Waiting costs discourage preventive care and diagnostic visits from being consumed at the levels that would be chosen if immediate service were available at current fees. Health services increasingly are diverted to crisis care, which requires more resources than the preventive care that could have forestalled emergencies. Finally, the increasingly higher proportions of less skilled workers per physicians are reducing the time required by both client and physician per visit.[6]

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[4] If a demander at the end of the queue is able and willing to buy a higher position but cannot, those who arrived first have imposed uncompensated external effects.

[5] Duff and Hollingshead [9] report considerable imposition of higher time in waiting, treatment, and diagnosis on the poorer patients. Washington, D.C., has announced plans for neighborhood, one-stop family health care centers, to be opened October 1, 1968. If time costs of visits have been high, and these promise to reduce them, these centers should be very busy [31].

There is no question that the quantity of services is restricted by the medical profession's maintenance of standards above the level that would prevail under free entry. There is excess demand for lower-quality care by those whose alternative is no care and by some who purchase available care. If there were some basis for comparing optimal standards and numbers of physicians with current levels, the difference could be attributed to monopolistic control of output. Physicians most directly concerned with standards of training and practice are professionally rewarded by maintaining high standards of training and research. The quality standard that they set might even exceed the best level for the income of the ordinary practitioner. Suppose that the quality standard were set so high that the (U-shaped) cost curve for care was above the demand curves of the poor and the rich, so that only price discrimination would enable the industry to sell its high-quality product at an average price that exceeded the cost of production [27, pp. 213–214]. Reducing quality would increase the quantity of care available at any price if lower-quality cost curves lay below, and would eliminate one quasi-publicly justified case for price discrimination. This agrees with what physicians say, and the rate-of-return data do not suggest much success in finding the optimum degree of entry restriction or quality standards for the economic interests of the profession.

The "shortage" of low-quality care illustrates one of the gravest defects of allowing the profession to regulate quality. It fosters the artificial distinction between public health and private care. The quality of delivered care may be kept high, while the average quality of care, or health, of all is low. The excess of U.S. infant mortality rates over the rates in other countries may be explained by differences in both the organization and the distribution of care between the United States and, for example, Sweden. Dr. David Rutstein explained that the Swedish mother maintains close contact with her midwife and sees her physician only if the midwife identifies abnormalities; a large proportion of U.S. mothers see neither midwife nor physician until late term or delivery [23, pp. 26–27]. Thus, some of the excess U.S. mortality rates may be due to the profession's insistence on the use of highly skilled specialists, or at least physicians, for these cases, to the exclusion of midwives.

There are increasing returns in many health services. The physician is an indivisible unit, and as he or a group of health service workers treat increasingly smaller communities, the cost per unit of service must rise if their incomes are to be the same as elsewhere [15]. For smaller communities this means that many classes of care will not be available and some care will be costly. The quantity and quality of service which an individual can buy in his local market depends, not only on his income or wealth, but also on the wealth and numbers of his co-residents. The uninsurability of all health risks bears heavily on residents of smaller communities; their effective coverage is less because the insured event is the treatment, and time and transportation costs stand between illness and treatment.

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[6] In Andersen and Anderson's survey of 7,803 persons in 2,938 families in 1963, in nearly 10 percent of individual visits to a physician's office the patient was seen by the nurse alone [3, p. 31].

It might be argued that those who choose to live in small communities accept the lower availability of health services there in return for wage differentials. But individuals have much firmer expectations about wages and employment in choosing residence than about the value of proximity to health facilities. Crudely, it is not obvious that the value of the wage differentials accepted by individuals will exceed the group's losses attributable to lack of care, just as it is not obvious that the value of waiting time, fairly certain for individuals, saved by purchasing less preventive care, will exceed a group's losses (whose incidence is highly uncertain for individuals) from future illness attributable to the lesser quantity of preventive care.

Increasing returns in health service firms, and the resulting variation in quantity and quality of services available across communities, mean that price discrimination by the profession is not an adequate means of ensuring care for the poor. Large communities with many high-income persons will support the care of some of their poor through price discrimination, but there is no way in which this mechanism can transfer care to the poor of smaller communities that have no large health service industry.[7]

Some of the "shortage" of health services may be due to local, rather than national, subsidy of medical education. Suppose that some total subsidy is required for the training of the number of physicians judged adequate for the nation, but that it is to be provided largely by states for local medical schools. Physicians can and do move their practices to other states [1, 14]. A state that desired to increase the number of physicians within its borders might do so more inexpensively by subsidy of the incomes of new entrants attracted from elsewhere than by subsidized expansion of its medical schools. The subsidies of training by individual states may not sum to the amount desired, because the state is not a monopsonist of skilled workers trained at its expense. A possible remedy for this source of shortage is the increased subsidy from the national tax base for training of physicians who will in any case distribute themselves across the nation in response to market forces.

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[7] Jerome Rothenberg [22] first raised this point.

Surveys of the health insurance coverage, expenditures, and services used by families and individuals reveal differences by age, income, education, and residence, that might be expected *a priori;* usage increases with income, size of community of residence, and education, and is higher for the very young, the old, and women of child-bearing age than for others [3]. But inferences from such data tend to understate differences in the quality of the health life-history between income and residence classes. The health outlay of the poor includes a lower proportion of preventive care, and a higher proportion of crisis care, than that of the affluent. Frequency of physical examination, for example, increases with income [3, p. 19]. Eighty-eight percent of upper-income women having live births in 1963 saw a physician in the first trimester of pregnancy, but only 58 percent of lower-income women [3, p. 43]. If preventive care is effective in reducing the incidence and severity of illness, then differences between health expenditures by income class understate differences in the health standard of living. For these comparisons, the product mix in health care consumption, or quality of health life-history, of the large urban area family of upper income, might be more useful bench marks than dollars.

Table 1 reports some physician and hospital rates per 100,000 population for the United States and for each of five county groups for 1966. The county groups range from 1, the most populous and urbanized, to 5, the least populous and urbanized. The number of physicians in patient care falls from 171 per 100,000 in county group 1 to 43 per 100,000 in county group 5; but the number of physicians in general practice per 100,000 is fairly uniform, ranging from 28 to 36. Thus, much of the variation in the total number of physicians is due to the variation in the number of specialists and hospital-based physicians per 100,000. Those physicians having longer training periods and more specialized functions are concentrated in the populous communities. Less populous communities have more hospitals per 100,000, but they tend to be smaller hospitals.

As population declines, so do beds per hospital, specialists plus hospital-based physicians per 100 beds, and physicians in patient care per 100 beds. For example, there were only one-third (11.8) to one-ninth (3.8) as many specialists and hospital-based physicians in rural county groups 4 and 5 as in group 1 (34.2) per 100 beds. From 44 to 81 percent of the physicians in rural county groups 4 and 5 were general practitioners (G.P.'s) and only 20 percent in group 1; 19 to 56 percent were specialists and hospital-based physicians in 4 and 5, but they were 80 percent of all physicians in patient care in group 1.

Of course, the variation in the quality of available care is due to variation in both the size of market population and its purchasing power; although population density falls across groups 1 to 5, so does per capita

Table 1. Health manpower and facilities by nation and by county group, United States, 1966

	U.S.	County group[a]				
		1	2	3	4	5
Per 100,000 population						
Physicians in patient care[b]	125	171	123	73	81	43
General practice	33	34	28	35	36	33
Specialists plus hospital-based physicians	92	137	95	38	46	8
Hospitals	2.9	1.8	1.9	4.0	5.3	6.3
Hospital beds	381	401	381	323	412	209
Per $100 million personal income after taxes						
Physicians in patient care[b]	52.7	59.5	52.0	38.1	44.9	30.0
General practice	13.9	11.8	11.9	18.3	19.7	24.4
Specialists plus hospital-based physicians	38.8	47.8	40.2	19.9	25.3	5.6
Hospitals	1.2	0.6	0.8	2.1	2.9	4.4
Hospital beds	160.9	139.8	160.7	167.9	227.7	144.9
Crude "quality" measures						
Mean number of beds per hospital	133	227	197	81	78	33
Specialists plus hospital-based physicians per 100 hospital beds	24.1	34.2	25.0	11.8	11.1	3.8
Physicians in patient care per 100 hospital beds	32.7	42.6	32.4	22.7	19.7	20.7
Physicians in general practice as percentage of total in patient care	26.3	19.8	22.8	47.9	43.8	81.4
Specialists plus hospital-based physicians as percentage of total in patient care	73.7	80.2	77.2	52.1	56.2	18.6

[a] County groups are as follows: group 1, 109 "greater metropolitan," in SMSA's with 1,000,000 or more population; group 2, 301 "lesser metropolitan," in SMSA's with 50,000 to 1,000,000; group 3, 889 "adjacent metropolitan," with population from 500 to 508,500; group 4, 1,024 counties containing one incorporated place with 2,500 or more inhabitants; group 5, 758 isolated rural counties.

[b] "Physicians in patient care" means the sum of those in general practice, specialties, and hospital-based practice.

Source: Rates were computed from American Medical Association data [2].

income. The variation across the five county groups in rates per standard unit of purchasing power is similar to the variation across the groups in rates per 100,000 population, with two exceptions. First, although the number of G.P.'s per 100,000 population was fairly steady, the number of G.P.'s per 100 million dollars rises from 12 in group 1 to 20 and 24 in groups 4 and 5. Second, the number of specialists plus hospital-based physicians per 100 million dollars declines less sharply across the five groups than the rate per 100,000 population; nevertheless, it does decline, so that the quality of available care per capita or per dollar declines with the size of the community.

The decline in quality and availability of care means that crisis or emergency care is less available in small communities and also that preventive or diagnostic care is less available. But some of the variation in quality and availability has less serious consequences and represents a more efficient allocation of resources than uniform rates. Although hospitals are smaller and less well staffed, there are more of them per 100,000 population and per 100 million dollars in smaller communities. The hospital collects both widely dispersed patients and physicians at a single point, thus expanding the case load of the physician over what it would be if he traveled to the patient. The patient's travel time is higher, but the physician's fee per case necessary to earn the same income as elsewhere is lower. For care of the chronically ill, patient travel to the hospital may be superior to the hypothetical alternative of uniform rates of practice across all regions, with higher costs for all.[8] But research is needed that would measure the value of the lower quality and availability of emergency care, and discouragement of diagnostic and preventive care, in smaller communities. The costs of less care might be sufficiently high to justify changes in the distribution of health services.

Are the variations discovered continuous across smaller divisions of the nation that are each more nearly the effective market area for the resident population, and can that variation be explained by the economic characteristics of the market area? We also should test the hypothesis suggested earlier, that while state and local governments subsidize medical education, physicians are highly mobile in a national market, and the effect of having a medical school in the state on the number of physicians will be slight relative to the influence of the economic characteristics of the market area.

We report in Table 2, for the 509 state economic areas of the United States in 1962, estimated linear regression equations of health manpower rates per 100,000 on these variables: number of counties in the area, its population, its effective buying income per capita, its change in population from 1950 to 1960, the presence or absence of a medical school in the area, and the presence or absence of a medical school in the area's state.

The number of counties in an area and its population are measures of geographic dispersion and size (in persons) of the market area. Change in population should reflect the influence, for example, of sharply rising or declining growth on the area's health manpower. Because the presence of a medical school in an area would increase the number of physicians (in teaching and in training by practice in the clinics of the teaching hospi-

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[8] In Andersen and Anderson's sample survey for 1963, insured rural nonfarm and insured rural farm residents [16] had higher numbers of hospital admissions per 100 person-years than insured residents of large urban areas [11; 3, p. 133]. Of course, rural residents may be older, but the effects of age on admission rates can not be inferred from the published data.

Table 2. Regressions of health manpower rates on economic variables, United States, 1962, by 509 state economic areas[a]

Dependent variable	Standard error X·Y (in parentheses) and constant term (1)	Number of counties (2)	Population in hundreds of thousands (3)	Effective buying income per capita in thousands of dollars (4)	Percentage change in population, 1950–1960 (5)	Area medical school[b] (6)	State medical school[b] (7)	R^2 (8)
M.D.'s plus osteopaths per 100,000 population	(39.241) 15.115	−1.022 (2.929)	−0.008 (2.816)	0.058 (10.353)	0.037 (0.487)	101.939 (15.807)	−5.592 (0.949)	0.599
G.P.'s per 100,000 population	(10.556) 21.638	0.402 (4.286)	0.001 (0.783)	0.007 (4.418)	−0.048 (2.353)	−1.126 (0.649)	4.123 (2.601)	0.076
M.D.'s under 60 per 100,000 population	(34.278) 10.867	−1.177 (3.864)	−0.008 (3.458)	0.044 (9.019)	−0.001 (0.015)	96.528 (17.134)	−6.342 (1.232)	0.598
M.D.'s not G.P.'s per 100,000 population	(37.000) −1.499	−1.636 (4.974)	−0.008 (3.226)	0.045 (8.518)	0.081 (1.129)	104.535 (17.190)	−8.774 (1.579)	0.611
G.P.'s as percentage of all M.D.'s	(11.826) 62.199	0.787 (7.489)	0.001 (1.221)	−0.016 (9.507)	−0.073 (3.202)	−16.248 (8.360)	7.052 (3.971)	0.557

[a] The "t" ratios appear in parentheses below the coefficients.

[b] Presence of school, 1; absence of school, 0.

Source: Change in population is from census data [28]; the presence of a medical school, from Public Health Service data [29]; other basic data are from Pennell and Baker [19], except that, on the assumption that the age and specialty composition of physicians in 1962 was the same as in 1959, we calculated the proportions by age, specialty, and general practice for each of the 509 state economic areas in 1959 from Stewart and Pennell [26], and applied them to 1962 rates.

tal) above the number that other variables would explain, it must be included; and the presence or absence of a medical school in the area's state is included to test the effect of having a school in the state on the numbers of physicians in any area of the state, other than the locale of the school.

Sixty percent of the variation in the number of physicians per 100,000 population (including osteopaths; the regression without osteopaths, however, is similar to that reported here) is explained by the six variables. The presence of a medical school in the state does not significantly decrease or increase the number of physicians per 100,000 population in an area of the state, other than the locale of the medical school. This may result from the fact that teaching hospitals draw patients from several areas of the state. Although the state medical school effect on the number of physicians in any area is slight, the health services available to the residents of any area are greater to the extent that they can travel to the teaching hospital.

Can the variation in quality as well as availability of services be explained by the economic characteristics of the areas? General practitioners have less formal training than specialists, and physicians over 55 years of age see fewer patients each year. Very little of the variation in the number of G.P.'s per 100,000 population is explained; but 56 percent of the variation in the number of G.P.'s as a percentage of all physicians is explained by the six variables. The proportion of G.P.'s increases with the number of counties and with the presence of a medical school in the state, and decreases with effective buying income, the presence of a medical school in the area, and population growth.

About 60 percent of the variation in the number of M.D.'s under 60 years of age per 100,000 population, and 61 percent of the variation in the number of M.D.'s who are not G.P.'s per 100,000 population, are explained by the six variables. Surprisingly, both decrease with the presence of a medical school in the state, and with population; both also decrease with the number of counties in the area; but both increase with the presence of a medical school in the area and with income. Given the paucity of young specialists in rural areas, and the negative coefficients on number of counties (rurality), the negative coefficients on population are undoubtedly due to the concentration of these physicians in urban and suburban areas rather than in large urban areas.

State-supported medical schools discriminate in favor of admitting resident applicants; whether this policy is intended to retain a larger proportion of those trained in the state, or whether a medical education is considered a benefit to be conferred on sons of residents, the effect is to reduce the quality of the entering class. A higher proportion of graduates of private than of state-supported medical schools take training in a specialty. Some of a state's specialists may be concentrated around the teaching hospital. These facts may explain why the proportion of G.P.'s tends to be higher in areas of a state that has a medical school.

We conclude that economic variables explain much of the variation in the quality and availability of health manpower services across the nation. The hypothesis that highly skilled practitioners redistribute themselves across the nation according to the economic characteristics of local areas and that the presence of a medical school in any area of the state except the locale of the school does not substantially increase the number of practitioners per capita is not refuted. (We are beginning further tests of this hypothesis, using data on physicians' incomes, place of training, and place of practice.) The paucity of health services in small communities is demonstrated, and its economic basis is clarified. Because health insurance generally compensates for treatment received, insured residents of small communities have less effective coverage than others.

The possibility of using practitioners intermediate between nurses and physicians, as suggested by the Swedish experience with midwives [23] and the Soviet use of Feldshers [11], and the value of a program of subsidized preventive care in small clinics in isolated areas, as proposed by the President's National Advisory Commission on Rural Poverty [20], deserve investigation. Two very different health systems, the Soviet and the English, have had difficulty in staffing health services in rural areas; something might be learned from their experience.[9] It is obvious from the research suggested in this paper that much remains for economists to do.

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Discussion: Community Facilities and Services

A. ALLAN SCHMID

Inquiry into the provision of community services can be organized into three broad questions: (1) What is the cost of different amounts and kinds of service? (2) What is the effect of a service, whether a consumer's or producer's good? (3) How can demand be communicated for these services? These are touched on in both papers, and several facets can be discussed further.

The first question is the best-developed in familiar economic analytics. Day calls it the cost and output problem. Techniques of production economics seem logical candidates for application. Yet empirical studies to date seem less than satisfactory. Day notes that the observed data are a mixed bag of nonstandardized commodities. You cannot develop a cost curve when the data are not separated into what is corn and what is wheat. Many economists have a tendency to assume that product categories and specifications are given and are not grist for their analytic mill. We have become so familiar with No. 1 and No. 2 wheat that we forget the choice that went into these specifications. When we get to something like education, we are frustrated by the lack of grades and specifications which distinguish one product from another.

Sometimes we forget that product categories do not exist in nature but are made by man to suit his collective purposes. I emphasize "collective purpose," since grades and categories cannot be individual if we expect trade and interaction. In many cases, they are public and common or they are worthless. Some product categories are of course private and are matters for negotiation between buyer and seller. It is interesting to note that few demand and supply elasticity studies exist for highly differentiated and uniquely specified products in the private economy. Economists have a limited role in product definition but a major one in forcing the issue. Take education, for example. People do discuss bond and tax issues for total spending or whether to add a swimming pool. But there is precious little public discussion of kinds of education. Surely, we do speak of vocational vs. college prep or our commitment to mass education as opposed to élite training. Still, this is like speaking of the product, grain, instead of No. 1 wheat and No. 2 corn.

We are familiar with the need to aggregate inputs in production economics analysis in order to make the problem manageable. Land, labor, and capital are categories which do not exist in nature. Similar aggregations must now be developed on the product side.

A. ALLAN SCHMID *is associate professor of agricultural economics at Michigan State University.*

Some confusion exists under the label "measurement problems." We must sharpen this. Much of our difficulty is not that we cannot tell more from less but that we have not settled the question of "what." You cannot measure or count until you have a taxonomy. Sometimes we contrast quantity and quality, but you cannot have the one without the other. I believe that economists must insist that the public develop as a matter of policy a number of product categories. These need not be fixed for all time, as witness livestock grades, but we must get an agreed-upon starting place. Governmental experience with program planning and budgeting systems is that we have been too vague on product categories and that clarification is a prerequisite to systematic analysis.

A second area for investigation is the flow of effects and consequences of community services. There is little consumer information for those that are consumption goods and little understanding of production functions involving them as producers' goods. Where is the *Consumer Reports* magazine for community products? The newspapers are not adequate. Here is an important role that public adult education and extension should consider. Again, much of this job is not the exclusive domain of economists. But we have worked well in the past with the agronomists, and there is no reason that similar associations with psychologists and physicians cannot be productive.

Product categorization is critical, not only for cost analysis but also for intelligent consumer choice. Care must be taken to avoid seizing on product characteristics which are intermediate rather than final, just because they are more obvious. For example, it is easy to see how many teachers have advanced degrees or whether foreign language is offered in the educational system. But these are not the final product. We are interested in what happens to the children that go through the system. Problems are compounded, since children are unique and the starting places immensely varied. Still, some product categories must be agreed upon. Reflection suggests that product categorization in human terms is a problem not unique to community services. We have been too satisfied with studying wheat and beef or their aggregation in terms of GNP instead of in terms of what kinds of people are produced when these items are used. It sounds like an immensely difficult task to develop some human-characteristic categories that can be related to community service production, but we shall be in the hands of the witch doctors until we do.

The final problem field that deserves highlighting is the institutional procedures for the communication of demand for community services. Professor Day, as well as the Ball and Wilson paper, opens with the observation that the nation finds itself poor with respect to various public goods. This suggests that demand is present and that people really want more but that demand is somehow frustrated and remains untranslated into production. How shall this proposition be tested? I do not have space to explore this in detail, but one line of inquiry is in terms of asking if there are certain product characteristics of community services which make it difficult for demand to be communicated in market institutions. Day speaks of the features of jointness of supply, externalities, and decreasing cost to size. Ball and Wilson discuss products which must be purchased far in advance of use but which may be of unpredictable value. These characteristics need careful study on a product-by-product basis if institutions are to be designed to carry demand effectively to consummation.

Day notes that we do not know the weights to attach to different objectives of community service. He asks how we can really measure the value of security, esthetics, human life, and citizenship. I would suggest that the question might be more fruitfully asked in different terms. There is an old saw which says that economists know the price of many things but the value of nothing. In that sense, we do not know the value of wheat *or* community services. How is it that we know the price or exchange ratios for cars and wheat? It is because society has agreed on the rules of ownership and contract for their exchange. We have decided what effects of certain activities are matters of property and therefore taken into account by decision-makers.

After considering the characteristics of community services and what guides to broad performance the community wants, we can decide what goods shall be produced by individual bids and what by group bids and taxes. In either case, there is a set of rules governing the relationships between the parties which shapes performance. In summary, then, I would suggest that we initiate institutional studies to indicate how performance is influenced by property, contract, and administrative rules, especially in terms of distribution and accountability.

THE THEORY AND STRATEGY OF COMMUNITY DEVELOPMENT

CHAIRMAN: JOHN O. DUNBAR, PURDUE UNIVERSITY

Theory and Practice in Community Development*

ROLAND L. WARREN

THE emergence of the Community Resource Development Program of the Cooperative Extension Service makes appropriate a review of certain relevant theoretical aspects of community structure and development and of current differences of opinion among professionals as to appropriate change strategies.

The "Great Change"

Let us begin with the changes which are occurring in American society, changes which presumably make community resource development an important and desirable kind of activity on which to spend the citizen's tax dollar.

Many observers have noted an interrelated cluster of changes which have been associated largely with western society but which are coming to be recognized as characterizing other societies as well. On the practical level, these changes have been grouped together in such concepts as modernization, or urbanization, or industrialization, or development. This overriding transition can be designated by the term "the great change." A number of salient dimensions of this great change can be briefly described.

First, as Durkheim noted, there occurs a progressive division of labor. Occupational tasks formerly performed by a single individual become divided in such a manner that various organizations share in the performance of one or another part of the task, and individuals within these organizations perform even more specialized roles. The obvious historical by-products of this process are well known: the tendency away from self-sufficiency, the intricate network of delicately interrelated parts of the productive system, the dependence on a money economy, the psychologi-

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ROLAND L. WARREN *is professor of community theory in The Florence Heller Graduate School for Advanced Studies in Social Welfare at Brandeis University.*

cal difference between working on aggregate tasks and working on fragments of tasks.

Closely associated with the growing division of labor is another important development, a differentiation of interests and association. As production tasks become more complex and individuals and organizations accommodate themselves to the various fragmented parts of these tasks, they ally themselves with others of similar occupation to further their own economic interests, and they find themselves associating with each other socially as well. Such social selection takes place, not only on the basis of the division of labor, but also on that of a new possibility which the changed situation generates: the possibility of associating with other people for reasons of congeniality of personalities or mutuality of interests, rather than merely on the basis of geographic proximity.

These developments in turn have resulted in the growth of strong relationships of people to systems which extend beyond their community borders. Thus, individual residents of communities have developed strong links to their respective extra-community occupational and interest groups. The same is true of the various types of organizations which are found in communities, whether governmental or nongovernmental, profit or nonprofit.

A related development, as intricate national systems and organizations arise around differentiated functions and interests, is the growth of bureaucratization and impersonalization. The extremely complex network of organizations and systemic interconnections is literally impossible to maintain without systematizing those interrelationships, clearly defining procedures, developing specific rules of performance, and in the process providing for a regularity and dependability of behavior and relationships. We have the widely heralded situation of the individual presumably "lost" in the web of impersonal relationships of bureaucratized organizations in the "mass society." At the same time, changes operate to weaken many of the older ties based on kinship, custom, and common residence.

Closely related to these processes is a transfer of functions which were formerly performed by family, neighborhood, and local community, to voluntary organizations, profit enterprise, and governmental offices. The result is that, increasingly, organized efforts to achieve social objectives occur within the framework of one of these three last-mentioned types of formal organizations. This has direct implications for community development.

To the economic and social developments already enumerated should be added the growth of cities and suburbs. Actually, some of the largest cities are declining in population. But this is only an artifact of the arbitrary political divisions within the metropolitan areas. Indeed, the decline in size of the largest cities is directly related to the increase in size of the metropolitan aggregates of which they are the core. In addition, there is a growth of smaller cities and a growth in the nonfarming components of the rural populations.

As an additional major characteristic of the great change, there are many indications of a change in values. One aspect of this value change is the gradual acceptance of governmental activity as a positive value in an increasing number of fields. Another is the gradual change from a moral interpretation of human behavior to a causal one. That is, increasingly people find themselves placing more stress on the causes of behavior than on moral admonitions to the "sinner" to improve his ways. Associated with this is a changing approach to social problems, from one of sporadic moral reform to one of gradual rational planning. Not so closely related, perhaps, but nevertheless highly relevant, is what seems to be an increasing change of emphasis from work and production to enjoyment and consumption. The much discussed Protestant ethic has tended to become replaced by an ethic perhaps most dynamically captured in the title of a recent book: *Enjoy, Enjoy!*

These are the kinds of development which are referred to here by means of the term "the great change."[1]

Now, community development efforts are related to this "great change" as both cause and effect. These terms are here used loosely, of course. What is implied is that a good part of the effort to bring about change with conscious intent on the community level is directed at engendering or hastening the great change. Now of course, what is usually consciously intended in community development efforts is to stimulate only certain aspects of the great change: for example, those of achieving a more viable economic interrelation of the community and the larger society—bringing the community into the national political picture, developing an industrial base, and so on. But of course the whole point is that all these various aspects of the great change are interconnected. It is difficult, if not impossible, to achieve some of them without finding the others tagging along, as more or less unwelcome guests. Right here in the United States, there is intense awareness of the problem of preserving and enhancing community at the same time that industrial development is encouraged. But, to repeat, much of the effort at community change is in the direction of hastening or encouraging the great change—although the change agent may not be aware of all the implications of this objective.

On the other hand, however, much of the effort at community change is directed at coping with aspects of the great change which have already become apparent and which are seen as social problems. An effort is made to cope with family breakdown, which is attributed to the great change, to restore a sense of community which many aspects of the great change have destroyed or jeopardized, or to coordinate the numerous social and technical programs which have grown up as a by-product of the division of labor, to cope with the very problems which the division of labor itself has helped to generate.

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[1] The concept is elaborated and these aspects developed at greater length in my book, *The Community in America* [16].

In community change efforts, however, the relationship of social intent to the great change is not the simple "either–or" that I have indicated above. It is not a case of attempting either to induce or to cope with the great change. It is usually a mixture of the two. For though the great change is widely prevalent, different parts of the countryside are ranged differently as to how far they have incorporated it. Some are only beginning. Others are in relatively advanced stages. But there are very few that it has not yet affected; and at the other extreme, there are none where it has fully run its course. Even within a single state, efforts at industrial and educational and social development take place at the same time as efforts to cope with the problems caused by such development.

Change—Purposive and Nonpurposive

But how much of the change which takes place is planned in any deliberate way, and how much just "grows" like Topsy? In some of the developing countries with a national plan and with the government controlling most or all of the inputs for developmental change, the ratio of control to change may be relatively high. But one need only be reminded of the sweep of industrialization, of the unwanted migration of rural workers to the cities in search of jobs which are not yet there for them, to appreciate the constraints under which national plans must operate.

In our own country, we have nothing which approaches a national development plan, and nothing like a unified program by a single agency charged with community development efforts. The ratio of centralized control to change is relatively low.

The assertion that most social change is nonpurposive, or without aggregate social intent, requires further brief elaboration, for it is frequently overlooked by practitioners at the community level. Most purposive change at the community level is a response to problems arising from the unplanned aggregate of individual decisions by persons, families, and organizations of one type or another as they pursue their interests and objectives. Such activity, in aggregate, is perceived as population increase or decrease or redistribution, either geographically or by age–sex category, or as "suburban growth," or "industrial growth," or "increasing automation," or higher longevity, or increased marriage or divorce rates, or smaller average size of family.

Most of what is called "planned social change" is a relatively modest response to these larger changes which are taken as "given" and are not the result of concerted, deliberate, centralized decision-making. Unemployment insurance is instigated to meet the contingency of unemployment, rather than to prevent it; city planning commissions take adaptive measures in view of such changes as population decline in the central city, suburban growth, new industrial location patterns, and the commuting phenomenon; social services are developed to help families whose individual lives dramatize the results of some of the larger changes.

As organizations and activities are thus set up to adapt in part to the largely uncontrolled changes which take place, these organizations themselves become part of the changing scene. In their activities, they may compete with each other in undesirable or wasteful ways, or they may leave gaps in available service, or their aggregate endeavors may not be adequate to accomplish their adaptive objectives. Thus, one particular field of planning has to do with establishing some minimum of purposive order among such adaptive organizations. Much of what is called *planned change* is of this adaptive type, rather than of any fundamental type which would change or redirect the major flow of events.

Likewise, of course, most of the basic, uncontrolled changes which take place at the community level do so in relation to forces outside of the local community and not subject to its deliberate control, as in the case of the general price level, or changing industrial production techniques, such as automation.[2]

The present situation is characterized by a bewildering number of programs, going into the hundreds, with federal or state or local governmental or voluntary sponsorship, in various combinations, and in various degrees of isolation from each other, constituting resources of money and program stimulation for community development. The complexity is bewildering, and the lack of coordination is notorious; yet the situation is far from chaotic, for there are many kinds of interagency linkages, horizontally at any level, and vertically between federal, state, regional, and local levels.

Concerting Decisions

Nevertheless, it is difficult for people and organizations to get together on whatever level is appropriate and determine what resources are open to them and utilize these resources optimally in the accomplishment of their goals, whatever these may be. Especially at the regional level, there may be no governmental or nongovernmental unit within which they can operate or even be brought together. But even where there is a governmental unit, only some of the problems and possibilities can be faced in a deliberate way by the established departments of the government. What becomes increasingly relevant is the need for getting together about the matters which are not the prerogative of any governmental department or nongovernmental organization, or which are shared by several of them with the result that little concerted action can be taken without interorganizational collaboration.

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[2] The preceding four paragraphs are adapted from my *Types of Purposive Social Change at the Community Level* [17, pp. 5–7].

How can effective decisions be made and effective action be taken where there is no formal organizational unit responsible for the decisions and action? In this question, perhaps, lies the principal rationale for what goes by the name of *community development.* The term has been used in many ways, and unfortunately it has been given a focus by many community development practitioners which is different from that given above. The focus has been one of seeking to restore the sense of fellowship and participation which people enjoyed in the small agricultural community but which has been largely destroyed by the great change. As a result, much effort has been wasted in trying to restore old-fashioned town meeting models of social participation under circumstances where they are increasingly irrelevant. At the same time, and for the same reason, community development has come under criticism as being both unrealistic and ineffective.

If the principal problem is one of making effective decisions and taking effective action where there is no formal organizational unit responsible for them, there are, of course, a great number of approaches to that problem, in the form of community development functions or departments or offices of various program-oriented agencies such as the Urban Renewal Administration, the Office of Economic Opportunity, the Social and Rehabilitation Service of HEW with its reimbursement to local welfare departments for community development activity, the programs of the Administration on Aging, the Model Cities Administration, and so on through a long list. Each of these organizations seeks to help citizens to organize to engage in programs which, by their very nature, have broad implications and tend to overlap with each other.

Thus, when the Extension Service develops a bold new program in community resource development it is not a question of whether it will be the agency which helps communities organize themselves to function more effectively. It is entering a field—rather late, incidentally—which is already very much occupied. Two or three years ago I described the burgeoning field of community planning by comparing it to a crowded pool. I think the analogy is still appropriate:

> Perhaps we can picture the individual planner as someone about to jump into a swimming pool. His goals and his methods are clear. He has the special knowledge which he needs. He is an expert swimmer. He will dive into the pool at one end, a beautiful shallow racing dive, and swim directly to the other end, using that enviable form which comes from years of con-

> centration on a particular skill, and the sacrifice of other interests and skills which such technical perfection demands.
>
> So, he jumps in. But I forgot to mention. The pool is not empty. There are a hundred and fifty other people jumping in or swimming underwater or splashing around in it. As he goes to dive, one of the other swimmers clips him on his way to buy a coke and a hamburger. Our planner no sooner hits the water than someone lands on him from the high dive. This latter is an expert swan-diver, who could do a beautiful job of planning and execution, except for our planner and the other hundred and forty-nine people in the pool. Our planner recovers, makes the necessary changes in course, launches out again, but zowie—someone who has been swimming underwater across the pool tries to surface but comes up on our planner's stomach. Does he ever reach the end of the pool? Let us forego an answer, but rather leave our planner swimming away in Kafkaesque fashion toward his desired change goals, head down, arms flailing, coming up for air as regularly as possible, and doing the expected among of kicking.

The implication for the Extension Service would therefore be that in its Community Resource Development Program it is not only concerned with helping other people and organizations to come together at various levels to explore common concerns and set goals and establish procedures for joint decision-making and action; for it, too, is one of these parties, one of these organizations, one of these swimmers in the crowded pool. It cannot coordinate all the other coordinators—and they wouldn't let it, even if it could. So it has to look to its own task of finding ways of working with other organizations, of setting up new coalitions, of developing with other organizations flexible ways of coming together around specific problems without constructing top-heavy organizational structures. It must learn to do these things just as it seeks to help others learn to do them. It is probably more important at this point in interorganizational development to be aware of the whole pool, and the position and direction and speed of the various swimmers in it, than to concentrate exclusively on doing one's own beautiful swan dive.

The whole idea of development in the term *community development* implies a process of what may be termed purposive change. As indicated earlier, most social change is not deliberately brought about in any inclusive way. Nevertheless, the whole implication and rationale of community development are that an attempt will be made through concerted decision-making to influence change in the direction of whatever goals may be involved. This implies a planning process in which the appropriate individuals, organizations, or whatever come together. As has already been indicated, the extent to which social change is controlled by planning of this type is often exaggerated, but in any case the planning function is an important focus. The other important focus, of course, is around the question of what people or groups come together, who makes the decisions, and in what kind of a social process.

Inclusiveness in Planning

Presumably, through deliberate planning, inclusiveness is brought to the decision-making which is taking place at various levels in the normal course of events. This inclusiveness which planning seeks to impose on the flow of events and decision-making can be analyzed into five components: (1) inclusiveness of system level, (2) inclusiveness of scope, (3) inclusiveness of time, (4) inclusiveness of geography, and (5) inclusiveness of participation.

Systemic inclusiveness is involved when parties which have been making their respective individual decisions and actions in a particular field don't like the aggregate result so well as they believed they would like it if they somehow pooled their decisions and made them centrally, in closer relation to one another. The simplest example is the traffic light, which presumably helps the individual drivers to get through an intersection more rapidly and safely than they could do with each simply plowing his own way through the traffic. Land use control through zoning is another example, where again the aggregate benefit is presumed to be greater if decisions as to land use are made on a more inclusive level than that of the individual landowner.

Inclusiveness of scope is involved where the decision in one kind of substantive area—say industrial development—is brought into relationship with decisions being made in a different substantive area—say educational and health facilities.

Inclusiveness of time is involved, not only where decision-making is related to solving the problem of the moment, but also where the problem of the moment is approached within the framework of a larger time span. Economists have pointed out the tremendous difference in short-run and long-run analysis. Time inclusiveness relates the short-run decision-making to the long-run situation.

Geographic inclusiveness is well illustrated by the growth of regionalism—the increase in emphasis on the need for some decision-making to take place on the regional level. Thus, a metropolitan planning body is set up to broaden the scope of decision-making to include not only the central city but also a large part of the surrounding metropolitan area. Or, with a still larger scope, regional planning may involve the efforts of several counties in a fairly large area, or of several states, or indeed of several nations.

Inclusiveness of participation has to do with the matter of who shall participate in the decisions which are made at any particular system level and for any particular geographic area. Shall decision-making be broadly diffused, or shall it be confined to a relatively small number of parties?

As the Cooperative Extension Service proceeds in community resource development (which the ECOP report defines as "a process whereby the people who comprise the community arrive at group decisions and actions to bring about changes which will enhance the social and economic well being of their community," it will be engaged in the process of planning or inclusive decision-making, and it will be confronting these five dimensions of inclusiveness: inclusiveness of system level, of scope, of time, of geography, and of participation in decision-making. They constitute one possibly useful outline for approaching community development projects.

Two Views of Community Development

But community development is not only a question of planning to enhance social and economic well-being; it is also a question of how the planning takes place. For many years, at least in the published accounts, there was considerable agreement that community development was a facilitating process which helped the people of the community determine their own goals and grow in competence to pursue them.

The Ross definition of community organization has been widely quoted: "Community organization," he wrote, "is a process by which a community identifies its needs or objectives, orders (or ranks) them, develops the confidence and will to work at them, finds the resources (internal and/or external) to deal with them, takes action in respect to them, and in so doing extends and develops cooperative and collaborative attitudes and practices in the community" [13, p. 39].[3]

In the past decade or so, newer conceptions have arisen to challenge this conventional community development approach. They offer alternatives in connection with a number of issues which any planning process must confront. These have to do with (1) consensus and dissensus, (2) directiveness or nondirectiveness, (3) process orientation or task orientation, (4) inclusiveness of scope, and (5) inclusiveness of participation. Let us consider them in turn.

1. *Consensus and dissensus.* Is there one course of action appropriate for the community on which all parties can agree? And should development efforts seek and confine themselves to such areas of agreement? Or are there important matters on which consensus cannot be reached but in which planning and action should nevertheless take place?

2. *Directiveness or nondirectiveness.* Should the principal strategy of the change agent be that of helping citizens determine their own set of goals and their own set of priorities? Or should he propose goals and attempt to persuade appropriate groups to accept them and work towards them? The same questions apply to the manner in which the goals are to be sought. Should he be directive in his approach or nondirective?

3. *Process orientation or task orientation.* Should the principal emphasis in community development be the accomplishment of tangible task

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[3] The definition has been slightly shortened in this quotation.

goals, such as a new zoning ordinance, or the setting up of an antipoverty program, or the improvement of the local school facilities? Or should the principal emphasis be placed on a process of group growth, trying to help the community develop improved communication, and structures, formal or informal, for decision-making and effective action, with the specific immediate task outcome being only secondary?

4. *Inclusiveness of scope.* Should the concerns of the community development program range over a wide spectrum of community problems and opportunities, attempting a more or less "global" process for total community improvement, or rather should efforts be confined to a relatively narrow substantive area, such as education, or industrial growth, or land use, or social services?

5. *Inclusiveness of participation.* Should efforts be made at securing participation by the total community, that is, literally, by as high a proportion of the population as possible? Or should efforts be confined to interested groups and those with decision-making prerogatives?

In these five matters, it is not a question of one or the other, for in each case there are various degrees between the extremes. Generally speaking, the older, more conventional or "puristic" approach to community development was characterized by (1) seeking consensus, even when this delayed or precluded positive action, (2) a nondirective stance on the part of the change agent, (3) emphasis on the process of decision-making and change, rather than on specific task goals, (4) inclusiveness in scope, with the total community and its well-being as the focus of concern, and (5) the broadest possible participation in planning and implementation by the entire population.

Recently, all five of these aspects have been challenged from one source or another. In each case, the challenge does not necessarily imply going clear over to the other extreme, but rather moving away from this more conventional position.

It is pointed out that there is no single set of community goals, but that various individuals and organizations have different goals, which often conflict with each other; and that it is precisely the most important and pressing issues about which people are divided, rather than united. To act only in consensus is to immobilize oneself.

Likewise, the change agent is not alone in his efforts (remember the crowded pool); he is competing with other change efforts with different sets of goals and priorities. He is competing for the time of busy people, often powerful decision-makers; he had better know what he wants and how to express it.

Further, since so much effort nowadays is based on temporary ad hoc coalitions around specific issues, the idea is to get together and get the task accomplished; training for community competence in any other sense than getting the job done often seems beside the point.

Likewise, the various concerns of the community are so comprehensive that an organization which seeks to play a vital role must most likely limit itself to one or a few subject areas rather than spreading itself thinly over a number of areas in which much stronger groups are likely to be involved, with higher stakes in the outcome.

Finally, the idea of trying to approach total citizen participation on all important issues is mathematically impossible in all but the smallest communities. The problem of participation is not so simple as one of "involving the whole community," or "letting the people decide." Hence, choices must be made as to who is to participate and in what capacities.

These points have been presented here in somewhat exaggerated form for purposes of emphasis. The point is that the older model of the nondirective involvement of the whole community in change efforts, with high emphasis on process, is coming to be increasingly challenged as time goes on. It is interesting to note that the manner and direction of this challenge are themselves a result of the great change. American society as it changes is moving away from a situation where the older model of community organization was relevant. Planned change efforts in their aggregate look less and less like an orderly committee meeting with complete participation and unanimous decisions, and more and more like the crowded swimming pool. The point is worth emphasizing, because it poses a set of choices as to community development strategy which the Extension Service will be facing as it considers its own efforts in community resource development.

Relevant Social Research

The field which community resource development encompasses is an extremely broad one. There is much social research taking place which should be of relevance. From the many research areas receiving attention today, three would seem to be especially important: the community power structure, community action, and the interorganizational planning, decision-making process. They are all interrelated.

A widely known work is Floyd Hunter's book on *Community Power Structure,* which first appeared in 1953 [6]. It pointed out that power to influence community action is unevenly distributed, and that in Atlanta, Georgia, which was the city studied, a relatively small group of top leaders were most important in decision-making. These leaders, who kept in touch with each other, were for the most part not the elected officials of government or of nongovernmental organizations; rather, they were the financial and industrial leaders, who in turn influenced the decisions of the official leaders.

A number of years later, Robert Dahl made a somewhat similar study in New Haven [3]. His findings, like those of Hunter, pointed out and documented the unequal distribution of power in New Haven, but differed from Hunter's in emphasizing the plurality of power configurations operating in New Haven and also the more influential role played by officials, both governmental and nongovernmental.

Of course, there have been scores of studies of community power since Floyd Hunter's study in 1953. In his book on *Men at the Top,* Robert Presthus gives a fairly comprehensive and readable summary of the research since Hunter, and also gives the methods and results of his own study of community power in two upstate New York communities [12].

Likewise, a number of studies have been made of action programs in American communities. A few of them can be mentioned as perhaps being of special interest. A group of sociologists from Michigan State University some years ago made a study of the process through which a rural county went when it undertook a broad health self-survey as a means of gathering facts and stimulating action. The resulting book, *Community Involvement,* has many important implications for community resource development [15].

In the metropolitan setting, Meyerson and Banfield made a study of the strategy of the Chicago Housing Authority in trying to achieve acceptance of its plan for low-cost housing in that city, and published a most informative book on *Politics, Planning and the Public Interest* [9].

A number of books are devoted to the dynamics of planning and politics in urban renewal programs. Rossi and Dentler examined an early Chicago urban renewal venture in *The Politics of Urban Renewal* [14].

In a book called *Urban Renewal Politics,* Kaplan examined the urban renewal program in Newark, New Jersey, in terms of the social–political dynamics of the action program [7]. Scott Greer has studied urban renewal in a number of American cities [5]. Alan A. Altshuler [1] and J. Clarence Davies [4] have written interesting analyses of the city planning process.

Peter Marris and Martin Rein have studied the dynamics of the Ford grey areas programs and the programs of the President's Committee on Juvenile Delinquency in a number of American cities, and their conclusions regarding the complex problems of social planning in the cities are particularly important [8].

There is a burgeoning literature of studies dealing with the nature of the planning–decision-making process itself as a part of purposive social change. The book by Bennis, Benne, and Chin is an excellent collection of research and theory in *The Planning of Change* [2]. My own shorter work on *Types of Purposive Social Change at the Community Level* is meant to be a contribution to this subject [17]. Robert Morris' book on *Centrally Planned Change* is a collection of papers on the subject by various authors [10]. The book by Morris and Binstock on *Feasible Planning for Social Change* is particularly good in considering attempts to bring about change from the specific standpoint of a change agent, as it were, entering the crowded pool and developing his own strategy in the light of what he would really like, what he thinks he can get, and how he can use what resources he has in order to bring it about [11].

Naturally, one can but indicate the type of work that is being done in the fields I have mentioned. There are other fields as well, and of course many works have not been mentioned.

To many people who have a concern for the community development field, this paper may appear to be cold and critical. It lacks the warmth often associated with admonitions to work in the good cause of restoring a sense of community to people and localities engulfed by the mass society.

The intent has not been to inspire, but to help clarify. Despite its didactic tone, this paper offers few answers. It raises some questions and points up some issues which must be faced if community development efforts are to be effective.

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Community Development Operation

J. Carroll Bottum[*]

NEARLY every citizen, from the inhabitant of the smallest hamlet to the resident of one of our great metropolises or from the individual voter to a member of Congress, supports the concept of community development in its broadest sense. It is when we talk about how it is to be brought about and what kind of development we want that the sparks begin to fly.

One could marshall volumes of statements by distinguished leaders across this land on the need for community development and changes in our economic and social institutions [42, p. 70]. The rapid rate of technological change, the lag in the modification of our community institutions, the changing interpretation of our values with our more affluent society, and the greater acceptance of the concept that an individual is partially the product of his environment—all make the need self-evident. The problems of delinquency, crime, slaughter on the highways, sanitation, housing, education, medical and recreation facilities, the socially isolated, culturally deprived, and underemployed further reinforce such statements. For these reasons, I shall make this phase brief, because I feel that there are now more critical considerations involved in making community development operational than in convincing leaders of its importance.

Objectives of Community Development

People have different definitions for community development. This is natural at this stage. However, if we are to make the most progress, we need to agree basically on what activity we are discussing even though we may use slightly different terms to describe it.

I should like to define community development as an effort to increase the economic opportunity and the quality of living of a given community through helping the people of that community with those problems that require group decision and group action [3]. It involves, on the part of the educator, not only helping clarify community goals, analyzing problems, and modifying programs under the existing institutional framework, but also inventing new approaches, new institutional arrangements, and new strategies for meeting community problems. You may wish to substitute the term *community improvement* for *economic opportunity* and *quality of living* or you may wish to define it in more detail.

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J. Carroll Bottum *is professor of agricultural economics at Purdue University.*

The terms *economic opportunity* and *quality of living* are as broad in scope of subject matter as anyone could desire. They are very inclusive. The words "with those problems that require group decision and group action" are restrictive in the sense that they rule out all problems that may be solved on an individual basis. For example, under this definition, the question of whether a community should have an educational program in the wise use of credit and the determination of how such a program should be organized might be community development. Administering the program and providing an individual family with information for making a credit decision would not be a community development activity.

The decision to have a youth training program and the decision on how to implement it might well be community development, but once the program was under way it would not be considered community development. This would be true even though the activity might be greatly contributing to the economic opportunity of the community. If an architect becomes involved in the actual construction of all the houses he plans, he soon becomes diverted from his real task. This does not mean that he does not study how the houses he designs meet his clients' desires in the final analysis.

All the activities of education should increase the economic opportunity and quality of living of a community. Not to limit community development to group problems and group decisions would make the community development objective synonymous with the entire program of education.

Some Crucial Aspects

In educational work in community development, one must realistically face up to the age-old questions: "Whom do we teach?" "What do we teach?" and "How do we teach?" Professional personnel is a limited resource, as are the interest and time of the community participants.

In this area, I should like to quote at length from two individuals who, I believe, clearly recognize the necessary approach and have expressed it well. The first is D. Mack Easton of the University of Colorado. The second is Gordon L. Lippitt of George Washington University. Mr. Easton writes:

> Why is Title I [Higher Education Act of 1965] potentially a failure? The Universities aren't ready for it. And they aren't ready for it in several respects.
>
> One of the most critical factors lies in the *differences between serving individuals, formal organization, and communities*. These are different levels of social system which call for much different educational approaches. Let me remind you of just one example of these differences. Both in the case of individuals and formal organizations, you know who it is that you must teach. In the case of communities, it is those whose opinions count on what subjects and what they must be taught, who have to be discov-

> ered. Neither faculty members nor ordinary extension men often know how to do this. Sometimes you as professional community development specialists don't do this too well yourselves. And there aren't many of you.
>
> The point is that we must understand the community and work with its component parts accordingly; which, in turn, takes special know-how and the people who have such competence are in short supply.
>
> Another critical factor is the *nature of community problems.* There is a sense in which communities do not have health problems, engineering problems, educational problems, economic problems, communication problems, or psychological problems; *rather,* they have community problems with medical engineering, educational, economic, communications, and psychological aspects—and others besides.
>
> Such problems need a comprehensive systematic approach—just what Title I asks for. Community problems are seldom solved by dealing with distinct aspects in isolation. Such urban problems as housing, transportation, land use and recreation all involve a need for good urban planning.
>
> But to raise the competence of the professional planners won't be effective.
> To raise the competence of the planning commissions won't be effective.
> To raise the competence of the urban officials won't be effective.
> To increase the understanding of the voters won't be effective.
> To improve the quality of the mass media won't be effective.
> To solve the problem of financing the work won't be effective.
>
> To do all of these things, in the right order at the right time and in correlated fashion, is more likely to be effective. But on the other hand, there may be still other critical factors. There is the problem of involving a half-dozen professions and disciplines just to get rational *planning* with regard to a problem. Much more must be done if it is to be solved.
>
> The point is that universities simply are not used to such comprehensive inter-disciplinary, inter-professional programs. Only a few are organized to make them even possible. Yet comprehensive attacks on problems are needed.
>
> As Piet Hein, the Dane, has put it, "All problems lose their meaning when we amputate them, cut off what we want in order to make them fit into our random frames of specialization." Yet this is the customary way for the academic specialist to work [1, pp. 7–8]

Mr. Lippitt writes as follows:

> The community planner faces utter frustration when his focus is almost wholly on his plans but hardly at all on the people they will affect. It cannot be forgotten that the people of a community possess the capability to make plans work or defeat them. Dealing with their fears and misunderstandings, as well as their logic and common sense involves something other than plans, blueprints and calculators. . . .
>
> What is a human resource upon which so much depends? It is the potential response of a person as an individual or in consort with other individuals. The basic human resource is the individual—a single, complex organism working in a variety of ways to supply his own needs. He can do this alone or in informal or formal face-to-face groups made up of other individuals working in a variety of ways to supply their needs.
>
> A community as a whole, therefore, is also a human resource. The com-

> mon commitment which is characteristic of a community is most dramatic in times of acute crisis or stress (for example, when a Mississippi River dike must be sandbagged). Most of the time, however, the individuals in a community are inclined to see less critical problems differently. This lack of uniform public understanding and evaluation leads to indifference and apathy that can be painful to those who seek action.
>
> Even deeper frustration is experienced by those who think success in mobilizing human resources is simply a matter of education, perhaps of using persuasive stimuli reinforced by sound truck, billboard and television. They usually say, "If this community really knew, we'd get action." They are partly right in that foreknowledge about a proposed or threatened change is essential to securing community commitment. They are largely wrong because community planning does not lend itself to the same techniques of salesmanship as beer or soap. . . .
>
> A newly-identified, but actually old-fashioned, key to obtaining commitment for a new idea is the involvement of the human resources, as a community, in face-to-face situations for the purpose of self-determination. This can be productive if all sides are thoroughly informed on all the ramifications of an issue (New England town meeting, very small village). But such an application of democratic values can and often does go astray. The avenue of self-determination usually requires a unique philosophy of acceptance and flexibility on the part of social planners. It may someday lead to the understanding of a new social law: *Never ask a community a question you don't want it to answer*. . . .
>
> Two decades of research and experience by social scientists have provided some guidelines as to why people resist change. It is my contention that people do not resist change itself; rather they balk at the methods used to put changes into effect.
>
> We can no longer shrug our shoulders and say "You can't change people." Research shows we can *change* people. In fact people *like* change. What they resist are the *methods* which managers use to put changes into effect [2, pp. 8–10]

Unless the significance of this individual and community acceptance and the importance of methodology, as well as subject matter, are recognized, community development is not likely to be made operational. Each activity must be viewed in relationship to the total goals of the community. In the beginning days of the automobile, a car was put out that had a perfectly fine engine for that day, but it constantly tore out the rear end. Naturally, the car was a disappointment and did not sell for long. Too many of our proposals from the university are perfectly sound in themselves, but they are not integrated into the goals and conditions of the total community.

Making Community Development Operational

In every community decisions are being made every day. There are people in every community who are making decisions for that community or choosing not to make decisions, whether we have a community program going on or not, or whether we think highly of the quality of the decisions being made. This is an obvious observation, but often we appear to forget it. The function of community development education is to tie into this activity and speed up and improve the quality of the decisions being made.

In every community there are different kinds of people. There are a few crusaders for change; there are the decision-makers or influence leaders; there are the active participants who, when it is decided that something should be done, carry out the activity; there is the concerned group, which is interested but not active; and lastly there is the group that does not care.

If community development workers are going to contribute most effectively to better decisions, they must have access to the decision-makers. In some way, the decision-makers must be found and exposed to useful information, just as the decision-makers in a business must be involved if technology is to be changed.

In Indiana we have used the approach developed by the sociologists by interviewing a group of 30 to 50 active leaders interested in various community activities and asking them to name, say, five people that they believe are dedicated, broad-minded, highly respected individuals, sensitive to the community needs, whom they would like to see entrusted with the planning of the community [5]. From this assembled list will appear individuals who have been named several times. The 20 to 40 people named most often but not on the original list to be interviewed are next interviewed and asked the same question. From both of these lists are then taken the 15 to 25 individuals most often named as a community committee. The second list generally tends to center on certain individuals more than the first list and the silent leaders come into greater prominence [6].

In the rural communities, where the background and goals of the people are more homogeneous, one tends to get an influence group fairly well representing, as a group, the total community. In the more complex industrial communities, one gets a merging of leaders, each of whom may represent the background and goals of individual groups in the community. This makes a more complex problem in operating a community development program. It requires modifications in some of the approaches used in rural communities. The greater use of mass media becomes more necessary in the larger, more complex communities.

In every one of our communities, there are many official and nonofficial groups organized to study and carry out programs. We believe that the uniqueness and strength of community development committees rests on their having no official power and not becoming directly active in any particular cause. The members' satisfactions must come from helping the community realistically think through its problems in an integrated manner, from helping to establish community goals, from inventing new approaches, from encouraging education when needed, from determining priorities and timing, and finally from seeing things happen in the community in which they know they had a part. This is the way in which such people have always achieved their satisfaction. The already established or newly established official and nonofficial action organizations that carry out the programs receive the credit or blame.

The charge is made by some reformers that working with the influence leaders tends to perpetuate the status quo. Working with this group does not decrease the opportunity for the crusaders to work in the community. As the attitudes of the community change, the influence leaders change. Remaining sensitive to the communities attitudes is the very way in which they became influential. The very fact that these individuals are willing to get together and study the potentialities of their communities insures a certain amount of open-mindedness.

We have not found the means of obtaining educational access to the influence leaders without identifying them and organizing them into a group. Perhaps there are other approaches for accomplishing this objective. We have not discovered them.

Seminars and conferences on community problems have a place in community development education. Community seminars directed toward the total goals and problems of a community are effective. They, however, give rise to continuing activity and the demand for some community organization. Special seminars without an overall planning committee tend to draw special interest groups together but leave out the desired overall integration if there is not a central group or integrated approach. As a means of extending the education of a central planning group, the seminar is effective.

After an action group has accepted the responsibility of working for a change in the community, there may be the task for an educator of making further analysis of the problem and assisting with the strategies of obtaining the desired goal. This is just the same as a farm or firm's needs for technical assistance in deciding the financing, the selection, and the acceptance of a new technical process into its business.

This brings up the place of the private community consultant. Many community projects may require the employment of a commercial consultant to make either detailed feasibility studies or detailed plans for carrying out the project. Ahead of these studies is the need for general, less specific feasibility studies in order for the community to determine what approach it wishes to follow and whether it wishes a detailed feasibility study made.

The community leaders need assistance from objective educators, who will assist them in identifying and clarifying their goals and problems. They need assistance in setting forth all the possible solutions to the problem that are open to them. They need an analysis of the costs and benefits of each alternative. They need an analysis indicating upon whom the costs and benefits fall. Many a project has failed in a community because the community leaders did not recognize how the costs and benefits were distributed.

The field extension staff, through the aid of the central staff, needs to understand this approach fully and to be able to handle the less complicated problems. They must understand the process for determining the influence leaders. They must understand how influence leaders operate. They must know how to keep committees viable, help them to clarify their goals, and be prepared to set up seminars and educational programs when needed. If a community development committee exists, they must be prepared to service such a committee effectively.

After developing a satisfactory overall approach to community planning, the continuing responsibility of the university central staff engaged in community development is developing the best alternative solutions to the problems of the communities, appraising the consequences of each, helping the community determine upon whom the costs and benefits fall, and, lastly, having competency in developing effective programs in each problem area.

Necessary Adjustment in the University

If our universities are to be most effective in community development, it will require an adjustment in the university's organization. Each university needs a core or mission-oriented staff group. This means developing a new profession or mission-oriented group just as we did when the farm management departments were developed 40 and 50 years ago, or when the agronomy and animal husbandry departments were created at an earlier date, or when the schools of business administration were developed at a later date.

The mission of these new groups should be the application of the arts and sciences to the problems of the communities. Most of the departments in our schools of agriculture are mission-oriented departments which draw upon several of the more basic disciplines, such as chemistry, botany, and, in the case of agronomy, genetics.

The function of these groups would be to provide a core group to take extension leadership in community development, to train undergraduates and graduate students in community development, and to conduct certain types of research.

Much of the more fundamental research behind community development and teaching should continue to be conducted in the various departments of the university. Relationships will need to be established for more effectively coordinating the department research and teaching with the core group. The subject matter departments will also need to be called upon for special subject matter in the case of extension.

Summary

The lag in the adjustment of our community institutions and the tensions and costs which they involve give indisputable evidence of the need for community development. Community leaders need assistance in clarifying their goals, identifying their problems, and establishing priorities. Once the problem is selected, they need assistance in discovering the possible solutions and in analyzing the consequences of each solution. To do this, they need to know the costs and benefits of each alternative from both the public and private standpoints, and finally upon whom the costs and benefits will fall.

The nature of the problems to be solved requires approaches that are not traditional to the universities' scientific staffs. The solutions to the problems of the communities require an integrated approach which requires changes in the approach in teaching and research, as well as in subject matter. This eventually will result in the creation of a new professional group, mission-oriented, in the university, and certain changes in the university's organization, if community development problems are to be effectively met by our institutions of higher learning.

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Discussion: The Theory and Strategy of Community Development

W. D. Toussaint

I have had for some time a basic confusion in my own mind as to what is meant by community development or community resource development. These two papers haven't completely solved my problem. But surely they present the concept more clearly than in a recent conference where community resource development was defined as (1) helping people help themselves and (2) a process by which those in the community organize and take action to solve group problems. To encompass all possibilities, an extension administrator said, "When you talk about CRD, you must think of CRD as the total extension program." At least, neither of the two people presenting papers today want quite this much for community development.

Getting back to the papers themselves, I was pleased that Warren emphasized the importance of relating community development activities to the economic factors of the larger community. So much of our CD efforts have been directed toward building a community center or getting pure water for the community that the relevance of relating to the larger area doesn't exist. Warren very correctly, I think, says that the focus of much CD effort has been on trying to restore the old-fashioned town meeting models of social participation. A good many of the CD efforts I've seen fall in this category, and I agree that this isn't likely to be a very fruitful approach in our modern society.

Bottum spells out an alternative to the town meeting approach in his paper. Apparently, he finds this method productive in terms of isolating local leadership and determining the goals of these leaders. He points out that it is the people who count who must be discovered; that is, community development workers must have access to the decision-makers. He puts forth a stout defense of this method of reliance on the decision-makers and their goals in developing a workable program in community development. He recognizes that certain "reformers" are critical of this approach as perpetuating the status quo. Although I never classified myself as a "reformer," I do have these same reservations. In many of the communities with which I'm familiar, some of the most important problems are those of education, access to jobs, and racial discrimination. It may be that the community leaders (the decision-makers) perceive these and similar problems and see their solution as important, but my experience suggests that this isn't always likely. Still, we may be able to use the gen-

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W. D. Toussaint *is head of the Department of Economics at North Carolina State University.*

eral concept, and I should point out that it is being used in the sense that the leaders of the poor are being sought out and used by some agencies in attempting to get at some of these basic problems of the poor.

I find Warren's discussion of changes in the five aspects of community development most interesting. He has convincing arguments that acting only on consensus means no action, that training for community competence itself is at least partially beside the point, that an organization dealing with community development should limit its activities to a few subject areas, and that total citizen participation is impossible. However, I'm not sure that I understand his implications regarding goals, and, if I do, I'm not convinced that I agree. He seems to imply that it is the change agent's (community development specialist's) goals that determine the decisions to be made. I remain a little puristic on this point and at least have some concern about letting the change agent determine the goals. It is pertinent to mention here that this point seems in conflict with Bottum's procedure of goal determination by the leaders of the community. I would ask if it isn't possible for a community development specialist to put forth more than one goal and the alternatives in achieving these goals —that is, as Bottum says, put forth an analysis of the costs and benefits of the alternatives. Someone or some group still has to choose the goal(s) if action is to take place. Exactly how the goal choice should be made, I can't say. I see problems inherent in any method of choice where a group is involved—as it must be in community development. What is needed here is a special strategy or system of determining group goals in such a way that positive action is encouraged.

Our two speakers see community development as an action technique, as opposed to a body of knowledge. Warren's contention that community development is a method of making decisions and taking action where there is no formal organizational unit responsible for the decision and action is quite reasonable. This, however, does differ from my earlier (apparently naïve) concepts of community development which put it closer to economists' ideas of area or regional development. That is, I looked upon it more as a body of knowledge or a subject matter set than an action process.

I'm willing to accept it as an action process or, preferably, an educational process. But I would hope that those of us (particularly economists) involved in community development give more than lip service to looking at the larger community or "functional economic area" in determining local community efforts. Then, I would like to see our economists as community development specialists concentrate on one or a few (as Warren suggests) of the issues, such as education, employment or job opportunities, land use planning, or public services. Perhaps more economic research is needed in these areas, and I would ask for that too. But we know enough about the economic aspects of regional or area development to integrate this knowledge more fully into our community development activities. Some of this is being done today, of course, but we can do much more that is really useful in bringing about community progress if we will use our economic tools and concentrate our community development activities on the bigger problems at hand.

Discussion: The Theory and Strategy of Community Development

GEORGE S. ABSHIER

Recognizing that it is easier to criticize than to construct, and being firmly convinced that these two papers should be required reading for all Community Resource Development educators, there are a few points in question and a few extra thoughts stimulated by these excellent papers.

Doctor Warren might have added another aspect of great change, to wit: the economic and social system has apparently resulted in a widening gap of opportunity between those individuals and communities which "have" and those which "have not." This summary result of the great changes mentioned by Dr. Warren is one of the stimuli to communities attempting to catch up, as well as a reason for some of the current government programs. A parallel thought is that one aspect of community resource development effort is that of helping communities to take advantage of some of these great changes. Warren directs some criticism at the planned change of the adaptive type. It seems to me that one of the jobs in community resource development is to show communities the means whereby they can adjust or adapt to changes, especially those beyond which they have no control.

I have not perceived, as Warren apparently has, "the attempts to restore the sense of fellowship," or "to restore the old-fashioned town meetings." The use of the real decision-makers in community meetings, indicated by Dr. Bottum, has proved to be quite effective in many instances.

I would like to suggest an additional category of inclusiveness for Dr. Warren. In addition to his components of inclusiveness of system levels, scope, time, geography, and participation, I would like to suggest that he add inclusiveness of resources, including local, regional, and national resources.

Dr. Warren seems to lean toward the directive approach rather than the nondirective approach. In moving away from the nondirective ap-

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GEORGE S. ABSHIER *is director of community and industry programs in the Extension Division of Oklahoma State University.*

proach, it is easy to move away from community resource development as commonly defined by most people, involving "group decisions and actions." A directive approach moves toward actions "for" the community. A more directive approach will probably achieve quicker short-run payoff, although perhaps occasionally in the wrong currency. But if the great changes continue, and I suspect most of us agree that they will, the needs for help in communities will come more and more frequently following a completely directive approach. Conversely, a goal-oriented process of leader involvement and development may be slightly slower in the short run but will reap greater payoff in the long run.

Although Dr. Bottum initially emphasizes the idea and planning stages of community resource development, he does point out the need for planning the action so that some results will be effected. I tend to think of community resource development in terms of the goals and needs of the community, with the result, impact, or payoff the primary criterion for evaluation. I felt that there was a lack of reference to the payoff, or impact, or the goal-oriented action in both these papers.

Several thoughts were stimulated by these two papers, which I will use as a summary.

1. Communities don't have problems, people do. There are people problems in communities that can be solved only by group decisions and group action.

2. Our goals and those of the people of the community with which we are working may be entirely different. If we are attempting to achieve truly effective community resource development, we have to work with the goals of the people of the community.

3. When we discuss community resource development in academic circles, we sometimes think only of *total* community resource development. Omitted from both papers is the fact that you can have small pieces of community resource development work, each directed toward the overall objective.

4. Many of the action programs have much less limited resources than we have in educational work. And we are frequently temporarily blinded by the flash popularity of action programs. Consequently, we are tempted to start bypassing fundamental educational programs.

5. We firmly believe that, from an academic standpoint, educational programs are much more sorely needed than are currently being supported at the national level (OEO currently gets $2.5 billion; Title I of Higher Education, less than one-fifth that amount; Extension, nationwide, less than a tenth of a billion dollars). This is not to criticize the action programs but to emphasize the fact that educational programs need additional resources.

6. The design of the educational programs is vitally important. Consid-

eration must be given to the several disciplines involved, the students involved in the program, and the methods to be used in the program.

7. Educational work on an extension level sometimes involves suggestions, demonstrations, leading, motivation, and other skills in addition to simple lecture or demonstration.

A final point, relating back to Dr. Warren's crowded pool illustration: a swimming coach can see the strokes of the swimmers better if he is not in the pool with them; however, both the coach and the swimmers have essentially the same goals and have a communicated understanding of these goals.

A CRITIQUE OF THE PSAC REPORT ON THE WORLD FOOD PROBLEMS

CHAIRMAN: R. A. KING, NORTH CAROLINA STATE UNIVERSITY

The President's Science Advisory Committee's Report on the World Food Problem: An Overview*

LEROY BLAKESLEE

The Committee's Task

PUBLIC interest in imbalance between food production and needs in the developing nations has fluctuated widely over the past several years as transitory, near-crisis food situations have developed and then subsided. Today, we consider the report of the President's Science Advisory Committee Panel on the World Food Supply at a time when most recent crop reports from the critical areas are favorable.[1] Undoubtedly, some will find the topic less compelling now than at earlier times.

The original charge to the panel came at a time when the atmosphere of crisis was very real. Failure of the monsoon in India had created a dangerous food situation. Madame Gandhi was on an urgent mission to Washington to speed resumption of U.S. food shipments, which had been interrupted following the 1965 India–Pakistan conflict. In this sense, the charge to the panel was as much a product of the weather over the Indian subcontinent as it was a recognition of any unfavorable change in long-term trends of factors affecting food balances. The panel was directed to consider (1) development of practical synthetic dietary supplements, (2) improvement of the nutritional value of food crops, and (3) the application of technology to increase food production. In other words, the panel was simply to consider ways of producing more and better conventional and nonconventional food.

The report reflects the panel's decision to adopt a relatively broad interpretation of its mission. First, food shortages are recognized as part of a more fundamental problem characterized by rapid population growth and inadequate rates of economic development throughout much of Latin America, Asia, and Africa. Against this background, the panel considers a

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* Scientific Paper 3165, College of Agriculture, Washington State University, Project 1320.

[1] Reasons underlying these favorable reports can be assessed only imperfectly, but Lester Brown finds the improvement in India to be "largely the results of solid technological progress" [2, p. 689].

LEROY BLAKESLEE *is assistant professor of agricultural economics at Washington State University.*

wide variety of possible measures for averting future food shortages. The breadth of the subjects considered is such that few, if any, serious proposals are not given at least a partial hearing.

The Structure of the Report

The report on the world food problem is presented in three volumes, and the structure of the report is related to the structure of the panel. Twelve subpanels were convened, with a total membership of 110. Each was assigned a topic area deemed important because of its potential for either defining the world food problem or contributing to its solution. The 14 chapters of Volume II contain the full report of each subpanel. Also included is a chapter evaluating three alternative sets of 1976 grain supply–demand projections for India and a most interesting chapter evaluating for consistency and economic feasibility the aggregate economic implications of the panel's findings and recommendations. Volume III contains resource papers prepared by subpanel members and consultants. Volume I contains the panel's analysis of the nature of the present and prospective world food problem, a summary of the opportunities for solving or averting the problem, and the panel's recommendations. The volume concludes with a chapter considering organizational and procedural problems associated with expanded U.S. involvement in foreign assistance programs.

Throughout most of the report the panel's analysis and discussion pertain to the food problem as it exists over the globe. India, Pakistan, and Brazil are given individual consideration in the analysis of several aspects of the food problem, but, more commonly, circumstances in individual countries are cited only to exemplify principles having global relevance.

Principal Findings and Recommendations

The report of the Subpanel on Population and Nutritional Demands forms the basis for most of the panel's assessment of the present and prospective world food situation. Except for slight variations due to data and assumptions, the assessment is in agreement with other investigations in this area [1, 3, 6, 7, 8, 9]. Falling mortality rates are seen to be a near-universal phenomenon throughout the developing nations, while fertility has remained high or has fallen only slowly. World population is projected to increase 40 to 52 percent above the 1960 level by 1985. Expected increases in the developing countries are much larger. The corresponding projection for Brazil is 70 to 85 percent; for India, 58 to 78 percent; and for Pakistan, 82 to 108 percent. Ranges stated reflect alternative assumptions about the future course of fertility.

The subpanel cites evidence showing that average diets in many developing countries are inadequate in both quantity and quality when compared to nutritional standards.[2] Of course, even where the average is satisfactory, large numbers of low-income people still consume substandard diets.

Based on these population projections and estimates of per capita consumption levels necessary to meet nutritional requirements, 1985 food demands are projected. Thus, the prospect of an 88- to 108-percent increase in demand for calories is foreseen for India in the 20-year period, 1965–1985. Corresponding percentage increases for Pakistan are 118 to 146; for Brazil they are 92 to 104 percent.

The panel concludes that, under present trends, the post-1985 food supply–demand situation in the underdeveloped nations will be so dominated by population growth that no action program can long forestall catastrophe. A long-term solution demands that human fertility in these areas be reduced. Moreover, the panel strongly urges that action programs be commenced now and that research, technical assistance, and capital funding for family planning be supported unstintingly.

In the short run, however, the panel concludes that human fertility control can have little effect and that improvement in human nutrition through 1985 can be achieved only by increasing food production. This short-term goal, then, is made the subject of the remainder of the panel's report.

As noted earlier, the several subpanels give consideration to a wide variety of measures holding some promise for alleviation of food shortages. However, while the panel recommends continued investigation of a number of alternatives, it is unequivocal in its conclusion that most of the additional food required must come from increased crop production in the developing countries.

The Subpanel on Increasing High Quality Protein deals with a far-ranging set of proposals for augmenting food supplies. Means of improving the protein in cereals through additives and selective breeding are considered, in addition to production of animal protein and oilseed protein. Marine protein sources considered include ocean fishing and freshwater fish culture, production and use of fish protein concentrate, and, very briefly, the use of algae. Leaf protein is evaluated, as well as the possible use of single-cell organisms grown on hydrocarbon and carbohydrate substrates.

Evaluation of the above potentials was difficult because several require technology and industrial processes which have not yet been fully developed and tested. However, the panel attempted to consider technical and economic feasibility as well as feasibility of production in developing countries.

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[2] Nutritional standards used were modifications of ones estimated by the Food and Agriculture Organization of the United Nations.

None of the proposals considered is ruled out from further consideration. The panel recommends that developing countries with promising opportunities be encouraged to expand production of fish, pulses, oilseed, and animal products where the animals are not competitive with humans for food. Further research is encouraged into the production and use of fish protein concentrate and development of genetic strains of cereals which provide higher quality protein. The panel recommends continued study of fortification of cereals with lysine and implementation of this practice in U.S. food aid shipments if feasible procedures are developed. Finally, although continued research is recommended, processes for using leaf protein, algae, and single-cell protein are judged to have little immediate potential.

The Subpanel on Projected Trends of Trade in Agricultural Products considers the roles of both food aid and commercial trade in the future world food situation. Efforts to upgrade diets in the developing countries by food aid shipments alone are judged to be of doubtful utility at best, and even completely unworkable after 1980. Food aid is seen as a useful transitional device, but one with damaging price-depressant effects on cultivators in recipient countries if improperly managed. Consumption in the developing nations would still be substandard by 1980, and reliance on U.S. concessional sales would increase markedly. Foreign exchange earning potentials generally are not high in the developing nations, and the subpanel is not hopeful about a large expansion of commercial food sales to them.

The subpanel's conclusions reflect their view that a solution to the food problem must be part of a program fostering balanced economic development with its attendant increased food-buying power. It is recommended that expanded food production in the developing countries be favored and that specialization and free trade be promoted among the developing nations. Furthermore, the subpanel recommends reduction of barriers which limit export sales of primary products from the developing countries to the developed countries. Such sales are needed to bolster foreign exchange earnings of the exporting countries.

Expanded production in the agricultural sectors of developing nations is seen as an important addition to average incomes as well as a source of food supplies. In effect, the panel is invoking Say's Law.

Five subpanels dealt with topics directly related to increasing developing nations' output by the use of natural resources and manufactured inputs in conventional agriculture. These were the subpanels on Intensification of Plant Production, Intensification of Animal Production, Manufactured Physical and Biological Inputs, Water and Land, and Tropical Soils and Climates.

In general, conclusions reached by the subpanels stress needs and methods for increasing crop yields in the developing countries. Much of the production expansion experienced by these countries during the fifties came from cropland expansion, and many have expressed doubts about the possibilities for continued expansion of the cropland base.

However, the subpanels on Water and Land and on Tropical Soils and Climate report some interesting findings about the possibilities for land expansion. Supplies of agricultural land in Asia are, indeed, small relative to anticipated food demand. But in much of Latin America and Africa, quantities of potentially arable land seem ample for any foreseeable needs. However, another conclusion of these subpanels is that much work remains before soil and crop managment practices appropriate for sustained high yields on tropical soils are developed. It should be emphasized that the panel does not conclude that cropland expansion should be encouraged in Africa and Latin America or that this would necessarily be the most efficient means of meeting future food needs in these areas. The panel only asserts that this alternative seems eligible for consideration.

Throughout the report a recurring theme is that individual proposals for improving prospective food supply–demand relationships should be considered only in concert with consideration of all aspects of the environment. This theme is embodied in recommendations for a "package approach," for consideration of "interactions," and for a "systems approach" and "systems analysis" in evaluating proposals for action. The theme is especially evident in the panel's study of improved technology, inputs, and production practices intended to help raise crop yields per acre in the developing countries. Thus, according to the panel, simultaneous efforts must be devoted to improving fertility levels, water availability, control of pests and diseases, and genetic improvement of crop varieties if yields are to be increased significantly.

Development of irrigation practices seems particularly important to agricultural improvement in Asia. Increased yields per acre are imperative, and the panel recommends increased multiple cropping in concert with development of larger and more reliable water supplies and faster-maturing crop varieties. In some areas, groundwater sources offer an alternative requiring smaller investments than surface water, but among all proposals considered by the panel for increasing food supplies, irrigation is seen as the most capital-intensive. The panel recommends expanded research efforts at an early date to probe the many unanswered questions in hydrology and economic feasibility related to such projects.

Increased water supplies also are seen as highly complementary to the improved crop varieties and increased fertilizer, pesticide, and machinery use recommended by the panel. Two aspects are considered in relation to the introduction of such practices. First is the problem of developing technology adapted for use in developing countries with soil and climate unlike those in the temperate zones. Temperate zone agricultural technology is not transferable, according to the panel's findings, and adaptive research must be greatly accelerated at an early date if needs for expanded indigenous production in the 70's are to be met. The panel recommends that U.S. technical assistance programs be expanded in support of this cause.

The Subpanel on Manufactured Physical and Biological Inputs considers a second area of importance to efforts aimed at increasing yields. The subpanel estimates quantities of fertilizer, seeds, pesticides, and machinery required for future food production in Asia, Africa, and Latin America, and then estimates direct investment needs for providing these quantities. It also estimates that costs to farmers for these items will increase from about 3 billion dollars in 1966 to about 14 billion dollars in 1985.

The Subpanel on Production Incentives for Farmers addresses itself to a set of problems which take extremely diverse forms over the world. But these problems share a common feature: all relate to the difficulty of stimulating large numbers of tradition-bound and frequently remote and illiterate cultivators in such a way that a largely subsistence agriculture may be transformed into a more productive, responsive, market-oriented producing sector. Here again, the panel recommends a package approach. In addition to making available necessary production inputs embodying proven new technology, a combination of complementary legal and tenure arrangements, tax policies, and extension services is recommended.

The subpanel strongly recommends that price policies be designed to stimulate production, not just to keep down the urban price of food, the major wage commodity. The subpanel cites evidence that peasant cultivators do adjust crop acreage in response to price changes. Furthermore, it asserts that, with proper incentives, a response in the use of yield-increasing inputs can be expected as well. Finally, the subpanel stresses the need for consideration of the general culture of any region in installing programs designed to modernize agriculture.

The Subpanel on Transportation and the Subpanel on Marketing, Processing, and Distribution of Food consider subjects slightly removed from food production but nevertheless important to the transformation from a subsistence agriculture to a market-oriented agriculture. The findings of the panel indicate that, in addition to improving distribution, quality identification, and market information, upgraded marketing services can be expected to contribute to effective food supplies by bringing about sizable reductions in waste and spoilage. It is this latter function which the panel designates for top priority in planning for the immediate future.

The Subpanel on Transportation concludes that in most developing countries the share of public expenditures allotted to developing and operating transportation systems is about as high as can be justified. However, here again the panel finds that agricultural development often is poorly served because governments fail to achieve balance in constructing complete, integrated transportation systems. Roads linking rural areas to markets have been underemphasized in favor of expanded intercity transport. The subpanel recommends a thorough study of transportation needs in developing countries to insure adequate access roads in rural areas where agricultural potential is high.

"The scarcest and most needed resource in the developing countries is the scientific, technical and managerial skills needed for systematic orderly decision making and implementation" [5, Vol. 1, p. 20]. This summary statement by the panel sets forth one of its major conclusions, and the findings of the Subpanel on Research and Education indicate that important obstacles must be overcome to satisfy the need. The output of educational endeavors in developing countries is inadequate in scale and misdirected in its neglect of topics related to agricultural problem-solving, according to findings of the subpanel. This same type of misdirection is cited in the educational programs offered to foreign students studying in developed countries.

Similarly, indigenous agricultural research programs in the developing countries have not been large enough. With few exceptions, public and private assistance from the United States and other developed countries has lacked the sustained commitment and proper organization needed to have a significant impact on agricultural production in these countries.

The Subpanel on Research and Education recommends high priority for development of indigenous educational and research institutions oriented toward consideration of the problems of agricultural and economic development. Expanded use of long-term commitments involving the U.S. government and universities with foreign programs is also recommended. Finally, international centers of specialization focusing on research and graduate education in agricultural problems of international significance are encouraged.

Volume II of the panel's report contains a chapter evaluating some economic implications of its findings and recommendations. The evaluation is necessarily somewhat crude in view of the global character of the investigation, but still it is interesting. Working from the panel's 1980 food demands estimated on the basis of nutritional needs, it is calculated that a 5- to 5.5-percent annual increase in GNP would be needed to generate the necessary economic demand. This rate is somewhat higher than that achieved recently in most developing nations, but the evaluators indicate that it does not appear unattainable. On the capacity side, an attempt is made to consider the size of direct investment requirements for production of modern agricultural inputs in relation to general past investment patterns in the developing countries. The estimates of required investment levels omit consideration of necessary investment in sectors of the economy having only indirect economic linkages with the agricultural sector. Also omitted are investment estimates for irrigation needs and for expanding the infrastructure of developing countries. However, the evaluators could report only that, *a priori*, the investment demands considered did not appear to be "impossible of achievement" [5, Vol. 2, p. 660].

Some Summary Comments

Early in its report, the panel lists several factors explaining why the food problems of the world remain with us despite billions of dollars' worth of food aid, capital assistance, and technical assistance from private agencies, governments, and international organizations. The enormous complexity of the problem is stressed. The panel finds that those involved have often lacked full understanding of this complexity and have responded out of humanitarian concern but with incomplete programs of action.

The panel's report can be viewed as an attempt to fill in some of the details needed for understanding of and objective response to the world food problem. The quantity of specific information is immense. But, not surprisingly, the report stops short of recommending specific and complete programs. The global character of the panel's approach precludes this. Even more detail, more facts, and especially more evaluation of alternatives are required before complete programs can be mobilized to meet specific needs.

The most impressive result of the panel's work, in my judgment, is that it provides, in concentrated form, a great deal of highly credible evidence that the technical problems of increasing agricultural output in non-temperate-zone developing countries can be solved. Others have asserted this but have provided only fragmentary evidence. However, I find in the panel's work the most convincing evidence yet that adaptive research can be successful in a short-enough time span.

In numerous contexts the panel recommends general areas for U.S. involvement. Both technical and capital assistance are recommended, but recommendations for technical assistance appear to be given more weight. However, the question remains, Where is the investment capital to come from? The investment estimates used in evaluating the economic implications of the panel's findings appear quite minimal in that no indirect investment needs were considered, irrigation investment was omitted, and infrastructure investments were treated in only an incomplete fashion. The panel quite rightly sees the food problem as one facet of an economic development problem, and the generation of investment capital for general developmental needs, including agricultural improvement, will be a very demanding task.

But at this point, the thesis of Coale and Hoover relating the rate of population growth to the rate of economic development seems very relevant [4]. Populations with high fertility have large numbers of children relative to adults. Such populations consume a relatively large share of output, save less, and hence invest less. Furthermore, a higher proportion of investment takes forms which add little to productive capacity, or add capacity which is utilized only after a substantial time lag. Thus, besides increasing food demand, the demographic situation in most developing countries would seem to be a deterrent to economic development to the extent that investment must be generated from indigenous savings.

If economic development really is the larger goal to which we should be addressing our efforts, then it seems appropriate to question the panel's choice of projecting future food demand on the basis of nutritional considerations and population estimates rather than on population and per capita income as has been done by others [1, 6, 7]. Certainly the population effect dominates the total food demand estimates in either case, but consistency would be better served by the latter, and attention would be focused on the more fundamental problem of economic development as evidenced by the level and growth of real per capita income.

Finally, though not part of the panel's designated task, it is interesting to note that only about three pages of the report were devoted to discussing why the United States is or should be concerned about the world food problem. Briefly, the reasons given are humanitarianism, maintenance of peace, and long-range opportunities for specialization and trade. It is clear that in these times of strenuous efforts to define and pursue our national priorities, there is yet no definite commitment to aiding with long-run solutions to the world food problem. Indeed, recent congressional response to moves aimed at trade protection and reduced foreign aid seem to portend a mood of isolationism.

The report of the Panel on the World Food Supply is not exciting reading, but the panel has produced a most worthwhile basebook, which orders and sometimes evaluates a great deal of knowledge on an immensely important and intricate subject. As such, it should find considerable use by those seeking solutions to the world food problem.

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Food Production Possibilities in North America

WESLEY G. SMITH

THE CRUX of the world food problem as described in the report of the President's Science Advisory Committee can be summarized as follows: "In the developing countries, where two-thirds of the world's population live, there is overwhelming clinical evidence of undernutrition (too few calories) and malnutrition (particularly, lack of protein) among the people" [8, Vol. 2]. The problem—inadequate production of food or the inability to purchase food in the developing countries in relation to the nutritional requirements of their people—is not caused by a worldwide shortage of food per se. Rather, it is a problem of distribution of food among the population, caused by inadequate economic growth and purchasing power of people in developing countries. In contrast, the problem in North America has been one of food surpluses.

This paper discusses the role which North America (the United States and Canada) can play in helping solve the world food problem as described in the PSAC report. Since it is obviously impossible to discuss all areas covered in the report, my remarks will be limited to (1) an evaluation of the projected supply of grains in world trade as it relates to North America and the developing countries, (2) the supply potential of North America—specifically, the estimated capacity to produce food (grains) by 1980 in relation to projected needs, and (3) action which North America can take to help developing countries increase their potential for food production and economic growth.

North America's Role in the World's Grain Trade

The dependence of both developed and developing countries on North America as the world's leading supplier of grains is evident from the data presented in Table 1.[1]

Wheat

Only two continents, North America and Oceania, had net exports of wheat and flour (wheat equivalent) in 1959–1961, with North American

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[1] It should be noted in Table 1 that in the 1980 projections for North America the United States is treated as a residual supplier—the amount of grain required to meet net import needs for the rest of the world is projected rather than the amount that could be supplied if U.S. capacity were utilized fully.

WESLEY G. SMITH *is agricultural economist, Division of Agricultural Development, Agricultural Resource Development Branch, Tennessee Valley Authority.*

exports being over six times as great as those of Oceania. All other continents were net importers. Projections for 1970 and 1980 also show that only North America and Oceania are expected to have surplus wheat for export, even though production is expected to increase in all continents between 1959–1961 and 1980. Exports from North America are projected to total 46 million metric tons—an increase of more than 80 percent. In 1965, total exports of wheat by the United States amounted to 22.6 million metric tons, of which 70 percent was exported under government programs.[2]

Given the projected expansion in exports for North America, an equally important consideration for future trade is the question of who will likely be the major importers. Western Europe has been the largest commercial importer of wheat in the past. If it becomes much more self-sufficient by 1980 and decreases imports by the extent projected in Table 1—while the developing free world countries more than double imports—then the bulk of world trade in wheat by 1980 will of necessity be between the developed nations and the developing nations. The PSAC report does not state how much of the projected wheat imports of nearly 40 million metric tons by the developing free world would consist of food aid in 1980, because commercial sales and food aid donations are not separated in their projections. Presumably, a great deal would need to be food aid. The reason is that the amount of foreign exchange needed for developing countries to purchase such a large quantity of wheat would greatly exceed their capacity to purchase it on a commercial basis and still allow for development of their own economies. As a consequence, North America as the dominant supplier of wheat in world trade would also have to take the lead in providing food aid. The extent would be determined by policy decisions by the governments of North America.

If the new dwarf Mexican varieties of wheat now being introduced on a large scale in India and Pakistan greatly increase yields, the amount of wheat imports needed by developing nations will be less than the amount shown in Table 1. Imports of capital inputs such as fertilizer and other chemicals and "simple" farm equipment may then replace large imports of wheat if it is assumed that domestic production of capital inputs will still be less than that needed to provide increased yields and production capacity in developing countries.

If the communist bloc countries (principally communist Asia) were to secure the 1980 imports of wheat shown in Table 1 and the United States were still to restrict sales of grain to communist China, then communist Asia would need to secure such imports from Canada, Australia, and/or Argentina. Presumably, these would be on a commercial basis, as in the

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[2] Source: computed from *Agricultural Statistics, 1967,* U.S. Department of Agriculture.

Table 1. Net balance of trade in wheat and flour (wheat equivalent), rice, and coarse grains by continent and political subdivision, 1959–61 and projections to 1970 and 1980

Geographical area	1959–1961		1970		1980 "adjusted trends"	
	Exports	Imports	Exports	Imports	Exports	Imports
	Net balance of trade in wheat and flour (wheat equivalent)					
	.... *thousand metric tons*					
Continent						
North America	24,982	—	37,700	—	46,000	—
Latin America	—	2,198	—	3,150	—	4,100
Africa	—	2,971	—	5,400	—	8,300
Western Europe	—	9,473	—	8,400	—	2,900
Eastern Europe & USSR	—	15	—	3,500	—	1,000
Asia	—	12,431	—	25,350	—	39,700
Oceania	3,940	—	8,100	—	10,000	—
Political subdivision						
Developed countries	18,511	—	32,250	—	49,500	—
Developing countries	—	16,903	—	32,250	—	49,500
Free world, developing	—	15,630	—	26,250	—	39,500
Free world, total	2,896	—	9,500	—	11,000	—
Communist bloc	—	1,288	—	9,500	—	11,000
Communist Asia	—	1,273	—	6,000	—	10,000
	Net balance of trade in milled rice					
Continent						
North America	989	—	2,023	—	1,970	—
Latin America	—	271	—	242	—	640
Africa	—	202	—	232	—	530
Western Europe	—	264	—	389	—	550
Eastern Europe & USSR	—	789	—	290	—	350
Asia	432	—	—	979	—	50
Oceania	55	—	109	—	150	—
Political subdivision						
Developed countries	—	237	427	—	—	100
Developing countries	187	—	—	427	100	—
Free world, developing	—	769	—	1,227	—	1,400
Free world, total	—	217	—	510	—	1,150
Communist bloc	167	—	510	—	1,150	—
Communist Asia	956	—	800	—	1,500	—

recent past. If Canada supplied the bulk of the 1980 import requirements of the communist bloc, plus part of the import needs of western Europe and Japan, then the major markets for U.S. wheat in 1980, other than western Europe and Japan, would be in the developing countries of the free world. In this case, an even greater proportion of U.S. wheat might be exported under some form of U.S. government program by 1980 than was exported between 1955 and 1965.

Table 1. (*Continued*)

	Net balance of trade in coarse grains					
Continent						
North America	11,252	—	29,550	—	54,000	—
Latin America	249	—	5,850	—	3,700	—
Africa	12	—	1,600	—	2,050	—
Western Europe	—	15,771	—	27,500	—	40,900
Eastern Europe & USSR	928	—	—	500	—	1,500
Asia	—	2,270	—	10,000	—	18,250
Oceania	1,057	—	1,000	—	900	—
Political subdivision						
Developed countries	—	99	200	—	6,000	—
Developing countries	—	781	—	200	—	6,000
Free world, developing	—	383	300	—	—	5,500
Free world, total	—	1,410	1,000	—	2,000	—
Communist bloc	530	—	—	1,000	—	2,000
Communist Asia	—	398	—	500	—	500
	Net balance of trade in total grains[a]					
Continent						
North America	37,223	—	69,273	—	101,970	—
Latin America	538	—	2,458	—	—	1,040
Africa	—	2,272	—	4,032	—	6,780
Western Europe	—	25,508	—	36,289	—	44,350
Eastern Europe & USSR	124	—	—	4,290	—	2,850
Asia	—	14,269	—	36,329	—	58,000
Oceania	5,052	—	9,209	—	11,050	—
Political subdivision						
Developed countries	18,175	—	32,877	—	55,400	—
Developing countries	—	17,287	—	32,877	—	55,400
Free world, developing	—	16,572	—	27,177	—	46,400
Free world, total	1,479	—	9,990	—	11,850	—
Communist bloc	—	591	—	9,990	—	11,850
Communist Asia	—	715	—	5,700	—	9,000

[a] Includes wheat, rice, and coarse grains.

Source: *The World Food Problem* [8 Vol. 2, Tables 2–16, 2–17, 2–18, 2–19, and 2–23].

Coarse grains

In contrast to wheat, the principal trade in coarse grains is projected to occur on a commercial basis among the developed countries of the world, especially between the United States and western Europe and Japan. The United States is projected to supply 52 million of the total 54 million metric tons of coarse grains exports from North America by 1980. Although Latin America, Africa, and Oceania are also expected to have net exports by 1970 and 1980, these countries in total would export only about one-eighth as much as the United States.

If the projections in Table 1 prove correct, North American exports of coarse grains by 1980 will exceed those of wheat by 8 million metric tons.

In 1959–1961 exports of wheat exceeded those of coarse grains by 13.7 million metric tons.

Rice

Projections for rice for 1970 and 1980 tend to parallel those for wheat. Only North America (in this case the United States) and Oceania are projected to have exportable surpluses of rice by 1980, with the United States accounting for 1.97 out of a total 2.12 million metric tons (Table 1). The projected exports of rice by the communist bloc represent a "trade-off" against expected wheat imports.

The new higher-yielding varieties developed at the International Rice Research Institute in the Philippines could also alter the picture for rice. It is unlikely that a worldwide surplus of rice will exist by 1980, since most of the world's rice is produced in the developing countries themselves, particularly in Asia. And it is in these same countries that future food needs are expected to be greatest. However, if the potential for increased production as a result of new varieties is to be realized in the developing countries, very large increases in fertilizer use will be required. This will probably call for substantial imports of fertilizers from the developed nations.

Total grains

Two estimates of production, disappearance, and net trade are given in the PSAC report for total grains in 1980. Based on the "adjusted trends" estimate shown in Table 1, net exports of grains from North America are projected to be 102 million metric tons. Under the "recent trends" alternative, which is not presented in Table 1, net exports are estimated to be 105.8 million [8, Vol. 2, Table 2-22].

To meet the 1980 "adjusted trends" projections presented in Table 1, the United States would have to increase coarse grain production by 73 percent over the 1959–1961 level and wheat production by 53 percent, compared with Canada's projected increase of 82 percent in coarse grains and 103 percent in wheat. Such increases appear to be possible for the United States, considering past trends in yields and the existing slack in land used for grain production. Although Canada can also greatly increase yields, there has not been the same slack in land use. Achieving such production increases in Canada would require extensive changes in land use, greatly increased yields, and corresponding use of fertilizers, in addition to bringing new but marginal land into crop production, especially in the Prairies, where most productive land is already cropped. Although the projected increases in grain production in Canada are possible, it is the author's opinion that they will not be easily achieved.

Role of North America in Supplying Food

The preceding review and evaluation of projections of trade in grains presented in the PSAC report illustrates North America's dominance in supplying grains to both developed and developing countries. Under the "recent trends" alternative in the PSAC report, imports by the developing free world countries are projected to total 46 million metric tons, compared with 45.8 million for the developed free world countries. Under the "adjusted trends" estimate, imports by the developing free world countries are *also* projected to total 46 million metric tons. If the projections of the PSAC report prove correct, under either of the 1980 alternatives presented, a large part of the total import requirements of the developing countries would have to be made up by food aid from North America. This is so because it is inconceivable that the developing free world will have advanced economically far enough to import essentially the same amount of grains on a commercial basis as the developed free world countries are projected to import by 1980. If wheat is valued at $60 per metric ton (the 1966 world price), the value of projected wheat imports alone by developing countries in 1980 would amount to $2.4 billion, or more than the total USAID budget for fiscal year 1969, as now (July 1968) projected. In 1966-67, wheat and flour exports under U.S. government-financed programs were $644 million.

If per capita consumption in the developing countries of the free world should remain static but production increase at the projected 1960–1970 growth rate, it is estimated in the PSAC report that their net imports of grains would amount to 20 million metric tons. However, this would be unsatisfactory, since malnutrition and undernutrition would be as widespread in 1980 as in 1964-65. Should production remain stagnant, imports could reach as high as 67 million metric tons by 1980.

The report makes it clear that, if the world food problem is to be solved, the developing countries *must* increase their own food production. However, even if they increase total grain production by 75 percent between 1959–1961 and the 1980 "adjusted trends" estimate—the increase projected in the PSAC report—North America will still be called upon to provide significant quantities of food. This is so because total domestic disappearance of grains is projected to increase by 86 percent in the developing free world—10 percent more than production. It follows, therefore, that North America will also have as great an interest, and will desire as large a voice, in helping solve the world food problem as the developing countries themselves. In fact, recommendations of the PSAC report [8, Vol. 1] make it clear that the United States expects developing nations through self-help programs to do their part and not rely upon expanded U.S. food aid to solve their food problems. Self-help plans must include some of the following: producing needed food, developing agro-industries, training farmers, constructing storage, improving marketing systems, encouraging private investment, ensuring incentives to producers, providing adaptive research, and funding agricultural activities. The report also states that the United States must take the lead in helping to organize for the task of solving the world food problem, and that it must be willing to maintain a sustained effort *for the next 10 to 20 years.* If the projections of the PSAC report and this analysis of its implications prove correct, Canada, as the second largest exporter of wheat, will also have to take a larger share of responsibility in the future than it has in the past [3; 8, Vol. 2].

Supply Potential of North America

Thus far, we have examined North America's role from the standpoint of the United States as the "residual" supplier to meet world food needs, and without regard to the amount which the United States is capable of producing. Unfortunately, direct comparisons of estimated supply potential for grains from other published sources with those presented in the PSAC report are not easily made, since the report gives neither yields nor acreages used in computing the various production projections for wheat, rice, and coarse grains. Similarly, information is not given on exactly which grains are included as "coarse grains." Such information would have been helpful to the reader and would have enhanced the usefulness of the report.

The capacity of North America to produce food depends upon the acreage allocated to each of the major food and feed grains and the yield of each crop. Several recent studies [1, 4, 5] have estimated U.S. agricultural output potential for the year 1980. Data from the Daly–Egbert study [4] and the Heady–Mayer report [5], as well as yield estimates from a study in which I was engaged [9],[3] will be used here as bases for projecting the supply potential of North America by 1980. In determining the supply potential, it is assumed that cropland is not held out of production through U.S. government programs. The results are presented in Table 2.

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[3] The 1980 crop acreage projections and the grain yields used in alternative I for the United States are from Daly and Egbert [4]. Yields used in alternative II are from Heady and Mayer [5], and those in alternative III are from Smith, *et al* [9]. Yield data used under alternative III were obtained from a special survey of optimum fertilizer use and yield potentials made through questionnaires sent to departments of agronomy and/or soil science throughout North America in 1967. As such, they represent the estimated "optimum yield" for 1965-66 cost–price conditions and assume optimum fertilizer use and improved cultural practices and other crop management and agronomic practices known to increase yields. It is assumed that such yield levels will be the "average" by 1980. Although the yield estimates under alternative III for oats, grain sorghum, wheat, and soybeans are higher than those under alternatives I and II, they represent a projected smaller yearly increase in yield (except for soybeans) between 1965 and 1980 than actually occurred for these same crops between 1950 and 1965. Presumably, by 1980 factors now limiting soybean yields will have been overcome through work of the nation's agronomists and plant breeders.

Table 2. Projected grain production capacity for North America, 1980

Crop	Acres harvested	Alternative I		Alternative II		Alternative III	
		Yield per acre	Production	Yield per acre	Production	Yield per acre	Production
	million acres	*bushels*	*million metric tons*	*bushels*	*million metric tons*	*bushels*	*million metric tons*
United States							
Corn	78.2	100.1	198.8	99.4	197.4	98.9	196.4
Oats	11.5	60.0	10.0	59.1	9.9	68.5	11.4
Barley	10.0	42.0	9.1	48.6	10.6	49.1	10.7
Grain sorghum	21.0	51.3	27.4	61.8	33.0	71.9	38.4
Total feed grains	120.7	—	245.3	—	250.9	—	256.9
Wheat	62.0	32.5	54.8	32.3	54.5	37.8	63.8
Soybeans	45.4	30.1	37.2	29.3	36.2	37.7	46.6
Rice	2.2	2.36[a]	5.2	—	—	—	—
Canada							
Corn	2.2					110.0	6.1
Oats	6.5					72.3	7.2
Barley	7.8					53.5	9.1
Total feed grains	16.5					—	22.4
Wheat	31.8					32.9	28.5

[a] Metric tons.

Source: Computed from Daly-Egbert [4], Heady-Mayer [5], and Smith *et al.* [9]. See footnote 3 for details.

Projected 1980 feed grain capacity in the U.S. for those crops shown is estimated to range from 245.3 to 256.9 million metric tons (Table 2). Canadian capacity is estimated to be 22.4 million metric tons, giving a total capacity for North America of between 267.7 and 279.3 million metric tons. Assuming that the crops included under feed grains in Table 2 are the same as those called "coarse grains" in the PSAC report (which may not be a valid assumption) and that the level of domestic disappearance is the same as in the report, then the projected capacity for feed grain exports for North America in 1980 would be between 67.3 and 78.9 million metric tons compared with the 54 million metric tons shown in Table 1. Similarly, the projected production capacity for wheat in North America would range from 83.0 to 92.3 million metric tons. This would leave a 1980 export capacity for wheat, after domestic disappearance, of from 55.7 to 65.0 million metric tons, compared with the 46 million metric tons in Table 1.

If the crop-acreage mix were different, larger or smaller amounts of specific grains could be produced. On the basis of the Heady-Mayer study, the computed optimum land use in the United States would call for

88.7 million acres of wheat, 94.4 million acres of feed grains, and 58.6 million acres of soybeans [5]. On the basis of this acreage mix and the yield estimates shown in Table 2, export capacity for North America could run as high as from 79.6 to 92.4 million metric tons of wheat, or up to double the projected export requirement presented in the PSAC report.

The above projections assume no increase in the amount of available cropland. If future needs demanded it, it is estimated that an additional 150 million acres could be brought into crop production in the United States at a cost of some $30–$50 billion. Such an investment, plus increased yields on present cropland, could double U.S. agricultural capacity in the next 30 years [11]. Greater use of irrigation in Canada and decreased summer fallow acreage in the Prairies could further expand the food production potential of North America. These investments and changes are, of course, not needed now and probably will not be needed over the next several decades. More likely, yields and productivity will continue to increase more rapidly in North America than we are willing to project, and land diversion programs will still be with us [7].

Several studies [1, 8, 10] have alluded to the possibility of excess agricultural capacity and a surplus of grains, especially wheat, by 1980. The analysis presented in this paper also confirms this possibility. Certainly, the capacity of North America to produce wheat far exceeds importers' capabilities to purchase it on a commercial basis. This will become increasingly true in the future if western Europe becomes more nearly self-sufficient, leaving the developing countries as the major importers other than Japan and the communist bloc countries. Such a situation would clearly have significant implications for U.S. and Canadian wheat producers and for government policy-makers.

Even if agricultural progress in developing nations does not achieve the compound annual aggregate growth rate of 4 percent during the next 20 years projected as necessary in the PSAC report, the world has ample productive capacity to meet the food needs of its population to 1980 and beyond. In fact, even allowing for the projected increase in world population, the developed grain-exporting countries of the world could easily have surplus grain disposal and price stability problems. At the same time, people in the developing world could have too little to eat because of distribution problems or lack of adequate purchasing power.

Technical Assistance

While food aid from North America can help stave off hunger and famine in times of food crises and, under the new multilateral food aid program obtained in the Kennedy Round Cereals Agreement of GATT [2, 12], can help upgrade nutrition, it is clear that expanding food aid per se is not the solution [6, 8]. In short, although not all developing countries need be or will become self-sufficient in food production, the world food problem will have to be solved in the developing countries through increased indigenous food production and reduced birth rates rather than by an ever-expanding amount of food aid from North America. Currently, in Pakistan, Taiwan, and the Philippines, the new varieties of wheat and rice give hope that the world food problem can be solved [13]. Although food aid is important in the short run, the most lasting contribution which North America can make is not giving food aid but supplying technical and capital assistance to developing countries to help them meet their future food requirements. This is well documented in the PSAC report and by other writers [6]. The really important supply potential of North America is thus to supply technical and capital assistance to the developing countries of the world. Although crop varieties and cultural practices are not directly transferable from temperate to tropical and semitropical agriculture, technical, managerial, and organizational knowledge, as well as some principles of plant and animal production, is transferable. It is in this role that North America can help provide the agricultural "brainpower" for education and basic and adaptive research through technical assistance programs. Besides technical assistance, North America can, in the short run, also help provide the capital inputs such as fertilizers, insecticides, and simple agricultural machinery so essential to increasing food output in the developing countries.

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Food Production Possibilities in the High-Food-Drain Economies

MARTIN E. ABEL

MY assignment is to examine and evaluate that aspect of the report of the President's Science Advisory Committee (PSAC) on the world food supply dealing with the potential for food production in the underdeveloped countries [11]. Because of the size and scope of the report, it will be possible to discuss only some of its major findings.

This lengthy report was prepared during 1966 and early 1967, a period during which it was fashionable in both professional and nonprofessional circles to talk about the next great famine [3, 4, 7, 10]. It was, to say the least, a time of mild hysteria with respect to the world food situation.[1] Now, less than a year later, some impressions of the world food situation have turned nearly a full 180 degrees [5]. There is talk about an agricultural production revolution and problems of surpluses in some of the developing countries. Who knows what the popular conception of the world food problem will be next year?

To help achieve some form of balanced perspective as to what the PSAC report says and means, it may be useful to back off from the short-run, yo-yo-like interpretations of the world food situation and take a long-term view of the problem. One can say that a few years ago we were in the midst of the *fifth* wave of scare about world food supplies and famine. Merrill K. Bennett discussed the first four waves in a most perceptive article published in 1949:

> The first [wave] was touched off by Malthus' famous "An Essay on the Principles of Population" . . . published . . . in 1798. The second wave came in the late 1890's in connection with the German controversy about the relative merits of agrarian and industrial national economies.[2] Perhaps an ephemeral shortage and high price of wheat was a contributing factor. It was in 1898 that Sir William Crookes delivered his famous address, "The Wheat Problem," to the British Association for the Advancement of Science; some people took it as a "cosmic scare." But again interest in the global food-supply problem waned, only to be stimulated by the third wave, for a few years after World War I. We are now [1949] in the midest of the fourth wave [2, p. 17].

The litany of the late 1940's bears a frightening resemblance to that of

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[1] The proponents of the possibility of large-scale famine did perform the useful service of alerting many people around the world to the importance of the world food problem and the need for better rates of agricultural development in many less-developed countries.

[2] See Ruttan [12] for a brief discussion of this controversy.

MARTIN E. ABEL *is deputy assistant secretary for international affairs, USDA.*

the mid-1960's. At a press conference in 1948 Sir John Boyd Orr, retiring director of the Food and Agricultural Organization of the United Nations, is reported to have "pleaded with the correspondents to help awaken the people to the fact that in the race between population and food, population was winning–'And we do not know how to stop it'" [2, p. 17]. Milton S. Eisenhower, in 1948 when he was President of Kansas State College, commenting on Sir John's prediction that food production must be more than doubled in the next 25 years if sufficient food is to be provided for all mankind, stated: "And I say in all earnestness that it is an open question whether food production, for all our science, can be increased that much" [2, p. 17]. These same thoughts were echoed by William Vogt in his book, *Road to Survival* [16] and by Fairfield Osborn in his book, *Our Plundered Planet* [9].

That was also the time of the "Fifth Plate" in the United States, a way of dramatizing that for every four persons sitting down to dinner in 1950, there would be five to feed ten years hence. "Within a few years, the Fifth Plate thesis had been discarded. Surpluses rather than shortages became the national concern. The threat to the American diet subsided as farm output rose more rapidly under the thrust of post-war technology and the rate of population growth and demand for food began to slow" [8, p. 1106].

Bennett concluded his 1949 article with the following note of cautious optimism:

> Time may prove today's pessimists to have been right in their attitude; the actual outcome remains to be seen. But if they prove right, the historical reasons are quite unlikely to be limited to an overrapid increase in population set against an overrapid destruction of soil resources. The future historian will need to inquire whether some other contributory causes were important–whether men and governments acted wisely in such directions as engaging in wars, keeping civil order, spending appropriately on education and research, taxing with propriety, intervening intelligently in economic life, nursing economic isolation, or freeing channels of trade. To follow the wrong paths is to hamper invention, stifle capital accumulation, hinder investment domestically and internationally, and hence to retard the general economic development, one aspect of which is improvement of national diets. If the right paths are followed in these directions, not only in human reproduction and in land use, time may prove today's pessimists to have been wrong, as with the pessimists of yesterday [2, p. 26].

Despite the dire predictions of the pessimists, the decade of the 1950's saw the developed countries of the world worrying about problems of agricultural surpluses and the developing countries of the world increasing per capita food and agricultural production at a modest rate [1, p. 8]. A study of agricultural output in 26 developing countries for the period 1948 to 1963 shows that 12 had

> compounded rates of increase in crop output of more than 4 percent per year. These rates surpassed those ever achieved by now economically advanced nations during comparable periods of time.
>
> From 1948 to 1963, rates of increase in crop output failed to exceed population growth rates in only 5 of the 26 countries. . . .
>
> The factors associated with differences in rates of increase in agricultural output among the 26 countries form a rational but highly variable pattern that is somewhat in accord with the uniqueness of each country in its combination of human, land, and capital resources, and technical possibilities, and in its institutional, social and political features.
>
> Rapid rates of increase in crop output have not happened just as a consequence of normal economic and social processes in societies organized on a laissez-faire basis. Rather, they have been undergirded by aggressive group action, generally national in scope, directed specifically to improving agricultural production conditions [15, p. v].

Then there occurred the panic of the mid-1960's. Spurious arguments became popular and emotions overrode logic. For example, one author, in discussing the accumulation of grain stocks in the 1950's and their reduction in the first half of the 1960's as an indication of the deterioration of the world food situation, stated: "An analysis of the trends in world stocks of grain—held almost entirely by the major exporters of wheat, feedgrains, and rice—shows the emergence of some new and disturbing trends" [3, p. 10]. But he did not state that almost all of these changes took place in U.S. grain stocks and were the outgrowth of a complex set of economic, technological, and political factors affecting agricultural supply management policies in the United States.[3]

PSAC Report on Supply Potential

I think that this background is important to understand the full significance of the PSAC report on the world food supply in terms of both substance and timing. It is probably the most thorough analysis of the world food problem that has yet been written, even though much of the analysis is not integrated and some parts of the world food problem are either touched on only lightly or ignored.

The report clearly recognized that progress on the food front had been made. Equally, it recognized that this progress and that of economic development has not been good enough. It does not conclude in despair that the "race" between population and food supplies in the developing countries has been lost. Rather, it sets out in reasoned and unemotional terms what we have learned to date about the business of agricultural development, where we should be going, and what needs to be done to get there.

The PSAC report sets as its production target for 1985 a level and composition of food production in the developing countries that will provide average diets that meet minimum caloric and protein requirements.

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[3] See Ruttan and Sanders [13] for an excellent explanation of the factors both in the United States and abroad that explain many of the changes in U.S. grain supplies and prices during the mid-1960's.

> The Panel's analysis of the overall problem indicates that the required compound annual growth rates (1965/66–1985/86) for the developing countries in aggregate will be:
>
> | | Percent |
> |---|---|
> | Increase in food demand | 4.0 |
> | Increase in food production | 4.0 |
> | Increase in gross national income | 5.5 |
>
> The achievement of such growth rates will require massive efforts which must be more successful than history has recorded in any previous 20-year period. Now the developing countries, in aggregate, are increasing their compound annual growth rates approximately as follows:
>
> | | Percent |
> |---|---|
> | Increase in food demand | 3.0 |
> | Increase in food production | 2.7 |
> | Increase in gross national income | 4.5 |
>
> * * *
>
> Additional investments for acceleration of agricultural output in the developing countries as a whole have been analyzed but not verified by detailed country studies. The direct capital requirement for fertilizers, seeds, mechanization, and pesticides for a 4.0 percent growth rate in agricultural output approximates $300 million annually in the early years, increasing to almost $4 billion per year by 1985. This estimate does not include direct investments in land and water resources nor does it include the necessary direct "infrastructure" investments in power, transportation, marketing, credit, food processing, storage, and distribution. It is estimated that *to achieve a 4.0 percent annual growth rate in food demand and supply, capital investments will have to increase from the current 15 percent to 19 percent of the gross national products of the developing countries. This would be equivalent to a $12 billion increase in investment above the 1965 base. To achieve such a feat will require capital and technical involvement of developed and developing nations alike on a scale unparalleled in the peacetime history of man* [11, Vol. 1, p. 22].

The PSAC report did not attempt to predict the most likely rate of growth in food production in the developing countries between 1965 and 1985. Rather, it established a set of targets for demand, production, and income that were thought to be reasonably consistent and possible of achievement with sufficient will and resource commitment by both developed and developing countries. Achievement of these targets would eliminate the average calorie and protein deficits in the less-developed countries by 1985. I will focus my attention on the practicability of the production targets in the narrow sense of looking at the technology, resource, and policy commitments required to achieve a sustained 4-percent rate of growth in food production in the developing countries. Whether or not this target makes sense in terms of consistent combinations of growth in demand, food production in the developed countries, prices, and world trade possibilities is another matter. For example, it is not at all clear that a 4-percent rate of growth in food production will, combined with nonagricultural development, generate a 4-percent rate of growth in the demand for food [1].

The PSAC report recognizes that better rates of agricultural development are not ends in themselves, but rather means for achieving better rates of growth in total economic development. Thus, agriculture is one part, albeit an important part, of the total economic system. Further, the modernization of agriculture precludes making sharp distinctions between agricultural and nonagricultural sectors of an economy. Modern agriculture needs industry and industry needs agriculture. It is not a question of either fertilizer plants or steel mills, but rather the right combination of the two. It is not a question of wheat or cotton, but rather what is the right mix. Finally, because of the many complementary relationships that exist in agricultural production, agriculture itself must be reviewed as a system and attention paid to the interrelated parts. Thus, the PSAC report takes a "package" approach to increasing agricultural output in the developing countries.

On intensification of plant production, the report states:

> For the immediate future, advantage should be taken of present knowledge of the geographic adaptation of many of the world's improved varieties. They should be tested widely in areas where they are likely to prove useful. Special attention should be given to the following:
>
> 1. Rice varieties from Taiwan that have been improved at the international Rice Research Institute which have short stature, stiff straw, and respond to high levels of fertilization.
> 2. Dwarf wheat varieties developed in Mexico which have wide geographic adaptation.
> 3. Maize varieties and hybrids, developed in tropical America and Southeastern United States, which appear to be adapted to areas of Southeast Asia and Africa.
> 4. Sorghum genotypes which have unusually wide ranges of geographic adaptation.
>
> For the long-term approach, five major considerations are involved:
>
> 1. Attention to basic food crops that can be propagated rapidly—wheat, rice, maize, pulses, oil-seed legumes, sorghum, millet, potato, sweet potato, yams, cassava, and banana.
> 2. Substantial breeding efforts, in the regions and by the nations where the crops are to be used, should be encouraged.
> 3. Establishment of organizations that can produce and supply adequate and dependable quantities of high quality seed.
> 4. Establishment of integrated national crop-oriented programs under unified leadership.

> 5. Plant breeders must utilize high levels of soil fertility in breeding programs in order to develop plant types capable of converting large amounts of nutrients into end products of better nutritional quality.
>
> The key to success in accelerated food production programs is the adoption of the "package of practices" approach including the use of new, high-yielding varieties, adequate fertilization and irrigation, and improved cultural and plant protection practices.
>
> Agricultural progress is being impeded in many developing countries by the following problems:
>
> 1. Lack of personnel properly trained for effective participation in national crop-production efforts.
> 2. Failure to emphasize yield concepts based on production per unit area per unit of time instead of fixed crop growing seasons.
> 3. Lack of capability of the United States in tropical agriculture commensurate with the expressed willingness to respond to the needs of less developed nations in the improvement of their agriculture.
> 4. An erroneous concept that agricultural technology can be transferred from temperate to tropical areas as effectively as principles of crop production.
> 5. Donation of food grains by the United States, or sale for soft currency, appears to have permitted some nations to hold down prices of grain or adopt other policies which discourage production by their own farmers.
>
> * * *
>
> The practical limits to intensified plant production are likely to be economic and socio-political rather than biological. . . . The formulation of agricultural policy giving agriculture the status, prominence, and priority which its importance demands is the first step in creating conditions for increasing production [11, Vol. 2, pp. 194–195].

On the intensification of animal production, the PSAC report focuses on the following points:

1. Control and eradication of a variety of animal diseases that make modern and productive animal production difficult or impossible.
2. Improvement of the genetic quality of animals, particularly breeds and strains that are resistant to the climate and diseases of the tropics.
3. Better utilization of and the development of new supplies of animal feeds.
4. Development of adequate marketing, processing, distribution, and transportation systems for livestock and livestock products [11, Vol. 2, pp. 243–293].

The PSAC report has estimated that to double agricultural output in the less-developed countries between 1965 and 1985 would require the following additional investments:

$17.0 billion for mining, manufacturing, and distribution of fertilizers.
$ 0.3 billion for production and processing of improved seed.

$1.9 billion for the production and distribution of pesticides.
$2.0 billion for the manufacture of farm machinery.

This makes $21.2 billion in total investments. These figures do not include the cost of obtaining necessary improvements in water management, land development, education and training of agricultural personnel, research and marketing, storage, and transportation facilities [1, p. 23].

Progress is being made in all of these areas, some faster than others. The acceleration of fertilizer production in the developing countries in recent years has been most dramatic. The PSAC report estimates that compared to the 6 million metric tons of fertilizer (plant nutrients) used in 1966, increases to 67 million metric tons will be required by 1985. A recent TVA report on the world fertilizer situation [14] estimates that fertilizer production capacity in the developing countries will increase from 6.2 million metric tons in 1966 to 16.4 million metric tons by 1972. Thus, this particular trend is in the right direction and accelerating.

But there are a number of other areas in which progress may not be sufficiently rapid. Land and water development is one of these. There are large areas of potentially arable land in both the temperate and tropical zones, particularly in Africa and Latin America. Some of this land might be developed in the traditional, subsistence way. But most of it will require large investments in land development; infrastructure to establish the communications, markets, transportation, education, health, and other facilities required for progressive development of communities; and, in many instances, research on how to use the soils of these areas and adapt plant and animal production to them.

Also, the development of abundant supplies of controllable irrigation water is not taking place at a spectacular pace. This is particularly important to the new wheat and rice varieties upon which so much hope for the future has been placed. The rapid uptake of the new varieties is taking place mainly on land with an assured water supply. The amount of such land is quite limited, particularly in Asia. Therefore, the rapid pace of adoption of the new wheat and rice varieties could begin to slow down significantly in a few years as the rate of growth in irrigation facilities becomes the overriding constraint.

In spite of the rapid progress made in research, particularly in grain production, much more needs to be done. As the PSAC report suggests, research work on a number of important food crops and animal production is being regionalized and spreading to individual countries. But this is taking place slowly. The development of productive scientific and educational institutions indigenous to the developing countries is a long-term process. And we have yet to determine the right type of scientific and educational mix that is most relevant to the agricultural development objectives of countries.

Probably more attention has been paid to the development of new technology than to its adoption. As Professor Bunting of the University of Reading has said:

> In all countries, yields are less than they could be for technical reasons (climate, soils, genetic potential of plans and animals, diseases, pests and weeds, agricultural methods) but in many they are limited also by economic, institutional and social factors which oppose change in agriculture.
>
> Where necessary, therefore, agricultural research programs must include research into these matters. Of them only agricultural economics has hitherto been generally regarded as a legitimate part of agricultural research, which has been preponderantly based on the objective and quantitative natural sciences which get into the field first. . . . However, as the social sciences come to grips with the real world, and learn how to define and measure quantitatively the concepts with which they deal, they must come into the party too [6, pp. 91–143].

Achieving a significantly faster rate of growth in food production in the less-developed countries will require considerable investment in both human and nonhuman resources, and a sustained political commitment to a type of development that recognizes the importance of agriculture. Although there are some very encouraging technological developments taking place, particularly in the development of new grain varieties, and a higher degree of political awareness around the world concerning the importance of agricultural development, there has not yet been a significant change in the volume of financial resources available for general economic development as well as agricultural development. There has not been significant general increase in the rate of savings for development in the less-developed countries. Certainly the levels of government financial aid from developed to developing countries is not increasing. The prospects for sharply increasing foreign exchange earnings through increased value of exports from the developing to the developed countries is not bright, as evidenced by the discussions of UNCTAD II. And although the flow of private capital to developing countries is increasing, it is not nearly enough to finance a major portion of future development.

Conclusions

When I look at all the things that have been done, are being done, and are likely to be done in the field of agricultural development, I come to these conclusions[4]:

1. The future rate of growth in food and agricultural production in the developing countries will likely be significantly higher than in the past but not average 4 percent a year between 1965 and 1985 as the PSAC re-

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[4] These conclusions are based in part on Abel and Rojko [1].

port set as a goal. The foundations for a better production record in the future were established a long time ago in places like the United States, Japan, Taiwan, Mexico, and the Philippines. And these foundations are continually being built upon. But at present there are no indications that the *total* resources required for a sustained 4-percent annual growth rate in food production in the developing countries will be available.

2. It has yet to be determined whether falling somewhat short of the PSAC-report goal for food production in the developing countries has any great significance. For example, one would certainly want to look at the possibilities of levels and terms of trade among developed and developing countries. And the levels and types of economic aid—particularly food aid —will certainly be important.

3. I don't see wide-scale famine as a very real possibility. Certainly, the continued growth of food production potential in the developed countries provides a considerable degree of insurance if something goes awry on a large scale in the developing countries. Intense hunger and famine may occur on a local basis but for reasons other than the availability of food in the world.

4. I think emphasis on increasing food and agricultural production in the developing countries will continue to shift away from almost purely physical or technological considerations, such as yields or nutrition levels, toward the general consideration of the role of agriculture in total economic development. After all, once a nation gets above the purely subsistence level, it does have some freedom to choose how it will employ its scarce resources and satisfy consumers' wants.

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ECONOMIC POLICY AND AGRICULTURAL DEVELOPMENT ABROAD

CHAIRMAN: S. K. SEAVER, UNIVERSITY OF CONNECTICUT

Effects of Some General Economic Development Policies on Agricultural Development*

G. EDWARD SCHUH

ECONOMIC policies directed to other sectors of the economy exert a very important influence on agricultural development. This is as true of fiscal and monetary policies, which attempt to influence the general level of economic activity, as it is of industry-specific programs which attempt to develop a particular sector such as the automobile industry.

All too frequently, however, agricultural economists tend to ignore these policies in their research and analytical work.[1] We tend to concentrate on those policies which are explicitly defined as "agricultural" policies and which bear directly on our sector of interest.

The burden of this paper is that the set of economic policies which low-income countries have followed in attempting to speed up their rate of industrialization have had a very sizable and detrimental effect on agricultural development. These policies not only have resulted in direct discrimination against the agricultural sector but also have affected it indirectly by reducing the labor-absorptive capacity of the industrial sector and therefore damming up labor in the agricultural sector.

My initial assignment was to discuss the effect of exchange rate policy on agricultural development. However, I have chosen to broaden the assignment and to discuss the broader set of policies which many developing countries have followed to accelerate their industrialization. I shall draw heavily on my experience in Brazil, but the set of policies I will consider is by no means unique to that country.

The paper is in three parts. The first section presents some background comments that set the stage for the analysis which follows. The second part describes the specific set of policies which I have chosen to analyze.

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[1] A good example is the recent book, *Agricultural Development and Economic Growth,* developed under the auspices of the Committee on Agricultural Economics

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G. EDWARD SCHUH *is professor of agricultural economics at Purdue University and program advisor in agriculture for the Ford Foundation.*

The third part analyzes the consequences of these policies on the agricultural sector. The paper ends with some concluding remarks.

Some Background Comments

It is fashionable these days to consider the problem of agricultural development as almost exclusively a problem of increasing agricultural output. Major attention is given to problems of production technology and to methods of obtaining a more rapid rate of technical change.

This paper is written from a different point of view. It is assumed that agricultural development refers to increases in per capita income of those who earn their living working in the agricultural sector. It is further assumed that obtaining increases in per capita incomes in this sector involves much more than just playing a new stream of technical knowledge into this sector. It is assumed that it involves the whole complex of agricultural and economic policies which bear on resource use, as well as those designed primarily to create and distribute new knowledge.

The recent alarms concerning the food problem have produced at least one healthy shift in emphasis.[2] Development economists as well as governments are giving more attention to agriculture. In fact, we are now in danger of going to the other extreme, with some analysts arguing for an agriculture-first policy as contrast to an industry-first policy. And perhaps more seriously—at least for some countries—targets are being set in terms of increasing food output only. Some place along the line we seem to have forgotten that the name of the game is economic development—which most economists take to be an increase in per capita income, rather widely distributed.

It is clear that many policies which attempt to increase food output can also increase the rate of economic development. This is particularly the case with those policies which increase productivity. However, a number of policies which could increase agricultural output need not necessarily increase productivity or the level of per capita incomes. In fact, many of the policies now being instituted, unless accompanied by appropriate complementary policies, can lead to serious income problems in the rural sectors. This is especially the case in countries like Brazil, where the economy is not blessed with a great deal of flexibility, and where the market for agricultural products is relatively thin. Substantial increases in output from the adoption of new high-yielding varieties can potentially create

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of the Social Science Research Council [6]. Although containing an admirable treatment of the problem of agricultural development, it gives practically no attention to the problem of general economic policy and its influence on the agricultural sector.

[2] For a contrasting view see M June Flanders [2]. This is an excellent analysis of the issues involved in choosing whether to develop the agricultural or the industrial sector.

adjustment problems that will make our own problems of the 1950's appear small by comparison. The rapid increase in the flow of technology into an economy with serious imperfections in the labor market is potentially a very revolutionary force.

For this reason it is important, not only that we stress a concept of balanced growth as among sectors of the economy—at least to the extent that comparative advantage permits—but also that we concentrate on developing and implementing policies which will promote increases in per capita income, in contrast to merely increasing food production by whatever means possible. This suggests that when considering economic policies for agricultural development, we consider the entire spectrum of policies, and not just "agricultural" policies.

Some General Economic Policies Which Affect Agricultural Growth

Until recently, industrialization ranked high among the policy prescriptions which were expected to lead underdeveloped countries out of their state of economic, social, and political backwardness. To obtain this industrialization, governments implemented a fairly specific set of measures, which, although differing somewhat in their detail, were fairly uniform among countries. Four of the policies which seem to have had an adverse effect on agriculture are as follows:

1. *Forced draft industrialization directed specifically to the substitution of imports.* This policy basically had three objectives: (1) to provide an engine of growth, (2) to bring the balance of payments into equilibrium by replacing the need for imports, and (3) to improve the terms of trade.

Some import-substitution industrialization naturally takes place as a result of the gradual expansion of an economy, even if it grows along an export-propelled path. Examples are the rather widespread establishment of industries which have substantial locational advantages because of transportation costs (beer, cement) and of industries whose market is large even when per capita incomes are low, such as textiles.

During the last two decades, however, import-substituting industrialization has not been just a matter of the natural growth of an economy, nor, for that matter, a response to cataclysmic events such as wars and depressions. Rather, many countries have pursued import-substituting industrialization as a deliberate development policy. The policy instruments used to implement this policy have gone beyond the mere use of protective duties and have included a wide array of credit and fiscal policies, pressures on foreign firms to set up manufacturing operations, and direct actions such as the formation of state-owned companies and/or development corporations or banks, which are assigned to promotion of specific ventures.

2. *Very high protective tariffs.* This policy is of course not new. The United States encouraged her own industrialization process by this means, and tariffs are still an important part of our commercial policy (even though the effect is usually to protect moribund industries rather than newly developing ones). However, there are important differences in this policy when it is pursued in conjunction with import-substituting industrialization. At one time, protective tariffs were justified primarily on the basis of the infant-industry argument. However, countries embarking on forced-draft, import-substituting industrialization tend to abandon almost completely any efforts to increase exports and, instead, direct their efforts both to production for the domestic market and to the reduction of imports. These two objectives are not always mutually compatible. The forced-draft industrialization increases the demand for imports of critical machinery and equipment, frequently at the same time that exports are declining as a result of the failure to raise productivity in this sector and because of discriminatory exchange rates. Consequently, high protective tariffs (or their equivalent in import restrictions) are established, not only to protect the infant industries, but also to reduce imports in general in order that scarce exchange earnings can be utilized to purchase the critical inputs needed to further the industrialization process.

3. *Overvaluation of exchange rates and the establishment of multiple rates.* Overvaluation of the local currency has two aspects. On the one hand, it reflects a natural desire to lower the price of the critical inputs needed for industrialization. In this respect it is a conscious policy and reflects a desire to subsidize the industrial sector at the expense of other sectors of the economy.

At the same time, however, some degree of overvaluation comes about as a result of the political difficulties involved in devaluating at a rate equal to the internal rates of inflation. This has been especially the case in Latin-American countries, where inflation has been and continues to be a major problem. Most countries have operated with pegged exchange rates and, because of the internal political difficulties involved, generally either defer action on devaluation until the exchange rate is seriously out of line or prefer import controls to a devaluation which would bring the exchange rate into equilibrium.

In addition to this overvaluation of the currency, many countries establish multiple exchange rates. In 1956, for example, Brazil had as many as 12 different rates of exchange applicable to the various categories of imports. In addition, it had a still different rate for coffee exports and an additional rate for other classes of exports.

The objectives of establishing this wide diversity of rates are multiple in number.[3] In large part they reflect a desire to channel the industrialization process in specific directions. In this sense they reflect the priorities which the government establishes on imports that are necessary to further the development process. In addition they may reflect political pressures—as, for example, in the case of the low rate allowed for wheat imports in Brazil. And finally, they may be used to exploit a monopoly situation in exports or, as in the case of coffee in Brazil, to lower the real price of coffee to the farmer in lieu of a more overt policy of lowering the domestic price.

4. *Credit and fiscal policies to stimulate industry.* These policies complement the import-substituting industrialization and the protective tariffs. Entrepreneurs who establish industries which substitute imports are afforded easier access to the credit market and, at times, at highly subsidized rates. In addition, a rather broad range of fiscal policies is utilized, such as tax holidays or lower rates of taxation for companies that produce import-substituting goods.

The Consequences of These Policies

This complex of policies, which involves forced-draft, import-substituting industrialization and a set of complementary policies, is receiving considerable re-evaluation today.[4] This re-examination reflects not only the increased awareness of the food problem but also a general disenchantment with the results of these policies in producing self-sustaining growth. Brazil, for example, found its growth coming to a sudden halt in the mid-1960's after it had experienced for over a decade one of the most rapid rates of growth in the world. Similar difficulties occurred in other countries [4].

What I want to do in the remainder of this paper is to examine the consequences of this set of policies on the development of the agricultural sector. Although a number of researchers are evaluating the effectiveness of the policies as an industrialization policy, considerably less attention has been given to their effect on the development of the agricultural sector. Yet they may well have a much larger impact on agricultural development than the sum total of the explicit agricultural policies.

The specific consequences are the following:

1. *A clear failure to develop the export sector, which in most developing countries is the agricultural sector.* Industrialization has been oriented to producing goods for the internal market, and this was supposed to pro-

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[3] For a rather comprehensive treatment of the rationale behind multiple exchange rates and their effect in a specific country, see Victor Gradin [8].

[4] Much of the pertinent literature is referred to in Hirschman [4].

vide the thrust or driving force for development. Increasing exports received little or no attention, since it was expected that the balance of payments could be brought into equilibrium by reducing imports.

Agriculture was neglected, therefore, not only because of the decison to concentrate scarce development resources in the industrial sector, but also because it was felt that the need to export was no longer important. This position was reinforced by a rather defeatist attitude about the possibility of increasing agricultural exports (especially given the Prebisch thesis of declining terms of trade for primary products) and by ideological arguments which insist that to export agricultural products and import secondary products is to be exploited by the imperialistic powers.

As a result, little or no attempt was made to strengthen the agricultural sector. No attempts were made to strengthen the physical infrastructure of roads, power, and communications for agriculture, nor were resources allocated for research and the development of new technology in agriculture. The result has been a decline in the productivity of agricultural resources and a consequent loss of markets to more well-developed countries.

2. *A failure to develop the capacity to supply new modern inputs.* A policy of import-substituting industrialization leads to the development of an industrial sector which is heavily slanted toward the consumer. At the time that this process starts, most countries are importing primarily consumer goods. The pursuit of the policy results in a heavy bias towards the production of consumer goods and a failure to develop the attendant supply industries for them—except perhaps as an afterthought. The result is not only high-cost consumer goods industries but also an almost total failure to develop industries which supply modern inputs to agriculture. Hence, not only do the countries fail to undertake research which would produce higher-yielding varieties and solve local production problems, but they also fail to supply the inputs which have been found to be effective in raising productivity in more advanced countries.

The most striking case of this, of course, is the failure to develop indigenous fertilizer industries. Countries such as Brazil, which have the natural resources and petroleum industry to produce economically most of the common commercial fertilizers, find themselves still today with only rudimentary and high-cost fertilizer industries. The reason is in large part that Brazil never imported substantial quantities of fertilizer, and hence the industry could not receive the incentives to develop that were going to other industries. On the contrary, the multiple exchange rate policy discriminated in favor of fertilizer imports in some periods, and this, together with the basic overvaluation of the *cruzeiro,* further hindered the development of a viable industry on a scale sufficient to lower per-unit costs.

Similar arguments apply to tractors, machinery and equipment, and insecticides and pesticides. Since these items were relatively unimportant at the beginning of the industrialization program, little or no incentive was provided to stimulate their production. And in addition, high tariffs and outright import prohibition have been imposed in order to channel the scarce exchange earnings to other uses.[5] The consequence is that the prices of these inputs are quite high in relation to product prices, and hence they are used on only a very small scale and for a limited number of crops.

3. *Noncompetitive prices for agricultural products in world markets because of overvalued currencies.* The adoption of new inputs which are necessary to modernize agriculture and raise productivity is inhibited, not only by the high costs or unavailability of such inputs, but also by overvalued exchange rates, which shift the external demand for these products (in terms of domestic price) to the left or downward. The consequence is an internal market price for many agricultural products which is below world prices, but in which neither the agricultural sector nor the total society is able to take advantage of the inherent comparative advantage. This is further aggravated at times by the outright prohibition of food exports because of a "cheap food" policy oriented toward the politically important urban consumers (especially notable in the treatment of beef by Argentina in the mid-1950's and coffee in Brazil, as observed above).[6]

Most countries take a rather pessimistic view of the possibility that they might increase their agricultural exports. Part of this view is due to a valid recognition of the low income elasticity of demand for primary products and to a belief that the price elasticity of demand is low as well. However, at times it is nothing more than a berating (in some cases quite justifiable) of the more well-developed countries for protecting their own agricultural sectors. Less frequently is it recognized that an overvalued currency discriminates against their own export sector.

A current research project at Purdue[7] is attempting to assess the potential for increased exports of agricultural products in Brazil under a more realistic exchange rate policy. This study deals with the potential earnings from corn, an important agricultural product in Brazil, but a product of which Brazil is only a marginal exporter—it imports one year and exports the next. Corn is classified as a nontraditional export, and in recent years it has never been the earner of more than $30 million of exchange earnings.

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[5] The protection itself might have stimulated the domestic industry. However, credit and fiscal incentives were lacking, since these inputs had never been major import items.

[6] For an analysis of the effect that licensing and other restrictive policies have had on the general economic development of Brazil, see Leff [5].

[7] Robert L. Thompson, "The Impact of Brazil's Exchange Rate Policy and Other Restrictive Policies on Its Exports of Corn," Master's thesis, Purdue University.

Estimation of a formal econometric model indicates that the elasticity of supply of both hectares and yield is approximately 0.13 and the elasticity of demand is −0.66. A crude estimate of the effect of the overvalued exchange rate and the restrictive licensing of exports[8] can be seen in Table 1, where the export price of Brazilian corn, f.o.b., is compared to the FAO mean price (also f.o.b.) for the 1960–1966 period.

Table 1. Difference between Brazil export price of corn and the FAO mean price, 1960–1966

Year	Brazil export price[a]	FAO mean export price[b]	Difference	
	.....*dollars per*	*metric ton*.....	*dollars*	*percent*
1960	41.1	50.1	9.0	21.9
1961	40.5	49.1	8.6	21.2
1963	42.2	53.1	10.9	25.8
1964	47.0	54.7	7.7	16.4
1965	49.9	57.2	7.3	14.6
1966	50.7	57.2	6.5	12.8
				$\bar{x}=18.8$

[a] *Anuario Estatistico do Brasil* [1].
[b] FAO [7, p. 196].

A very crude estimate of the effect of a more rational exchange rate and the elimination of export licensing can be obtained by assuming that the f.o.b. price in Brazil is equal to the FAO mean price. The result would be a cutback in domestic consumption and an increase in the quantity supplied. The possible exports, if these conditions were to prevail, are indicated in Table 2.

These data are preliminary, and in addition are at best a crude measure of the export potential, since transportation costs are ignored. However, they suggest that considerable potential existed for increasing corn exports had a more rational commercial policy been followed. The increased exports would not only have provided additional exchange earnings which could have been used to further the development process in the industrial sector but also would have increased incomes in the agricul-

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[8] Licenses for overseas sales were denied to exporters unless there was clear indication that the domestic market was being "adequately" supplied. The decision rule followed was that export licenses were denied if the domestic price, though lower than world market prices, was rising. Since this was a period of constant inflation, this criterion was frequently fulfilled. As a result, export licenses were often denied, leading to the diversion of exportable production to the domestic market and the stagnation of the export quantum.

Table 2. **Actual exports of corn compared to possible exports, Brazil, 1960–1966**

Year	Actual exports	Possible exports
	thousand dollars	
1960	408	83,667
1961	180	82,488
1963	29,504	156,114
1964	2,928	77,291
1965	27,915	117,260
1966	31,804	100,157

Elasticities
Area planted = +0.130
Yield per hectare = +0.126
Domestic disappearance = −0.655

tural sector and perhaps provided the economic incentive necessary for modernization. It is worth noting in passing that, in the case of nontraditional exports such as corn, a country like Brazil faces an essentially perfectly elastic demand curve.

4. *Very low labor-absorptive capacity for the industrial sector.* The overvaluation of the currency, the multiple exchange rate, and the subsidized interest rates in the capital market have in part contributed to the implantation of a capital-intensive industrial sector.[9] The granting of special tariff exemptions and lower exchange rates have kept the relative cost of foreign capital equipment below that of other types of imports. A consequence has been that the industrial sector has absorbed a relatively small portion of the labor force leaving agriculture. For example, in Brazil —despite its very rapid rate of industrialization during the decade of the 1950's—employment in the industrial sector stabilized at about 7 percent of the total labor force. Hence, industrial employment was increasing at about the same rate as population was increasing (around 3 percent), despite the fact that industrial output was increasing at a rate of about 9 percent a year during this same period. The result is that most of the labor leaving agriculture during this decade (and it was significant) was channeled into the service sector, where relative wages appear to be declining as a result of the substantial supply shifts.

It is clear that the low labor-absorption capacity of the industrial sector is due in part to labor market imperfections and to the lack of skills possessed by the rural migrants. However, the capital-intensive nature of the industrial sector must in part be due to the cheapening of the price of capital as a result of the direct and indirect subsidies to capital goods and a low real rate of interest. These result in the choice of capital-intensive industries and then, within the industries, a choice of a capital-intensive technique.

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[9] The "overpricing" of labor as a result of minimum wage laws and other government regulations has contributed to this also.

The consequences of this to agricultural development can be great. Migration out of agriculture may be less than it might be if more job openings were available in the industrial sector. A labor scarcity in agriculture could induce mechanization and a general substitution of capital for labor.[10] This in turn not only encourages the adoption of a higher level of technology (the use of modern inputs) but also raises the productivity and in turn the incomes of agricultural labor. These of course, are the *sine qua non's* of agricultural development.

5. *A redistribution of income.* The particular set of development policies followed by many low-income countries affects the distribution of income in two important ways. Many such countries—and Brazil is a good example—are heavy exporters of primary products. Overvalued exchange rates mean that the exporters of traditional primary products receive a lower real income than with an equilibrium or undervalued exchange rate. The result is a decline in per capita incomes in this sector, and a disincentive to the investment which is necessary to modernize and raise productivity. The consequence, of course, is an agriculture which stagnates, or which at least does not make the contribution to total growth which it might.

Of perhaps equal importance is the effect which the general attempts at strengthening the industrial sector over the agricultural sector have on the distribution of income. Even in the best of worlds, in which industrialization succeeds in lowering the real prices of industrial goods, the fruits of such progress tend to go to the upper income groups rather than to the lower income groups. The products produced by the industrial sector, at least as it has developed in countries like Brazil, generally are consumed by the upper income classes. If the prices of these goods are lowered by industrialization, the upper income classes are the beneficiaries, together with those somewhat lower on the income scale who can now consume the products. If the development effort were directed toward raising productivity in the food sector, with a consequent decline in food prices, the benefits of such progress would be distributed very progressively in favor of the low-income groups, since a larger part of their budget goes for food items.

Some Concluding Comments

I should not want it to be concluded from my comments that I am arguing for an agriculture-first development policy, or that low-income countries should not industrialize. Clearly, for most countries, an important measure of development will be the fraction of their labor force which is producing nonagricultural goods and services. However, many countries are now becoming concerned about their agricultural sector, not only in terms of its ability to feed its populace, but also in order to obtain a more balanced and hopefully self-sustaining rate of growth. The burden of this paper is that development policies followed by many countries in the postwar period have had serious consequences to the agricultural sector and, if not leading to stagnation, have at least prevented this important sector of the economy from making the contribution to development which it might have made.

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[10] Implicitly, of course, we are arguing for a more capital-intensive agriculture and a more labor-intensive industrial sector. For more on this, see Flanders [2].

Many low-income countries are quite dependent on external markets—and particularly the external markets for primary products. The efforts directed towards industrialization are, of course, an attempt to get around this and to become masters of their own fate. However, the need to meet rather heavy foreign-debt servicing is a continuing problem for many of them and may become even more important in the future. Hence, import substitution alone will not do. The need to export will be ever there. Efforts to increase efficiency in the export (that is, agricultural) sector can make a contribution to long-term growth.

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Pricing and Allocative Efficiency in Agricultural Development

LEHMAN B. FLETCHER

> Economists, it's plain to see
> All think that *Prices* are the key;
> For no economy will grow
> With inputs high and output low
> —Kenneth Boulding.

AGRICULTURAL price policies have emerged as an area where there is great agreement in principle but a woeful lack of operating guidelines in development theory and practice. Everyone agrees that the terms of trade should not be "too unfavorable" to agriculture to avoid destroying incentives to produce more through use of better methods and more efficient combinations of new and traditional inputs. On the other hand, neither should they be "too favorable," since agriculture as the dominant economic sector must make substantial contributions of food, foreign exchange, labor, and capital to other sectors. This paper explores some of the implications of this "razor's edge" policy dilemma. Its central concern is with the pricing of agricultural output and the responses of producers, consumers, and government to the operation of the pricing mechanism.

Agriculture and Economic Development

Analyses of the relationship between the agricultural sector and economic growth have centered on the various "surpluses" which agriculture can provide to support development in the urban-industrial sectors. Several well-known models depend on the transfer of labor with low or zero marginal productivity from agriculture to nonfarm employment as a means of growth. Food must be extracted from the agricultural sector at a rate commensurate with the labor transfer; otherwise the terms of trade would turn against industry, the sector where profits are expected to support high savings and investment. Rising food prices would raise wages and reduce profits, thereby limiting capital formation, the rate of growth of nonfarm output, and the increase in urban employment. Labor—and its share of existing food supplies—can be transferred most easily if agricultural production does not fall as labor is withdrawn [13, 23]. The problem of feeding the urban population will arise if food production does decrease in response to the lower level of labor input [6].

These labor-surplus models have left largely unanswered critical ques-

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LEHMAN B. FLETCHER *is professor of economics at Iowa State University.*

tions of how the necessary urban food supplies can be extracted from agriculture, what means can best be used to create favorable terms of trade for industry, and to what extent and how agricultural development must be achieved to supply food to the cities and offer a market outlet for the growing industrial output [16, p. 25]. The strength of the postulated food–price–wage–profits relationship can also be questioned on the basis of the observed tendency for industrial wage rates to rise very high relative to agricultural incomes. In this situation, low food prices will mainly mean more real income for those workers fortunate enough to find employment, rather than higher profits and increased savings [14].

The high rates of population growth in many developing countries and the apparent failure of industrial employment to increase at the same rate as industrial production point to another inadequacy of these models—the limitation of the agricultural sector to serving as a repository of labor waiting to be absorbed into nonfarm employment. In some countries, urban population growth and rural–urban migration have swelled the labor force beyond available or anticpated employment possibilities. In these same countries, the agricultural population is probably still increasing in absolute numbers, a phenomenon likely to continue for some time in the future. In this situation, the agricultural sector must meet the challenge of feeding both the growing rural and urban populations but by means which raise employment as well as output per person employed [27, pp. 9–12]. Exploitative extraction of agricultural output, by encouraging urban migration and discouraging production, can aggravate problems of both employment and food supplies in the cities.

Other analysts have emphasized the possible contributions of agriculture to the large capital fund required to finance infrastructure, industry, and other investments for economic growth. The logic of this position is that agriculture, as the dominant economic sector at early stages of development, must make some net capital contribution to the sectors that can be expected to grow more rapidly as development and structural transformation proceed.

Transfers of investment resources can be accomplished through one or a combination of the following three methods:

1. Persons who receive income from agricultural production can invest privately in other sectors.

2. Governments can use taxes and tax-related measures to obtain revenue from the agricultural sector for public investment.

3. The terms of trade can be turned against agriculture to increase profits in the high-saving sector of the economy [11, p. 460].

No general rule has been given for deciding how much agriculture can contribute to the economy's investment fund. In fact, there is a growing tendency to question the basic proposition that capital should flow on a net basis from agriculture to other sectors [24]. If agriculture is considered integrally in the framework of allocating scarce investment resources among alternative growth-inducing activities, it may well be that for maximum growth capital should flow into agriculture. The difficulty is that the government is limited in the extent to which resources can be "squeezed" out of agriculture and unfavorable terms of trade established if the incentives and means for farmers to save and invest in the modernization of agriculture are not to be seriously impaired. Yet if public expenditures for agricultural development are high and agricultural taxation is low, a heavy financial burden will fall on the nonagricultural sectors, with corresponding negative effects on incentives, savings, and investment.

The third type of "surplus" which has been emphasized is the physical excess of food production over food consumption in the agricultural sector. It has been suggested that this agricultural surplus is a necessary precondition for initiating and sustaining economic growth [21]. Concern with the size of this surplus underlies the popular notion that food demand resulting from rapid population growth, rising per capita incomes, and increased urbanization is pressing on agriculture's capacity to produce in the less-developed regions of the world. Many countries are thought to "require" an increase of 5 percent per year or more in agricultural output to meet anticipated needs for food, raw materials, and export.

This approach to the agricultural surplus also emphasizes the role of productivity in developing the market linkages between agriculture and other sectors, that is, the flows of food and raw materials to nonagriculture and the reverse flows of consumer goods and manufactured inputs to agriculture. Increased productivity and income per person are necessary conditions if agriculture is to play a role in the expansion necessary for rapid growth in nonagricultural production. Emphasis on cost-reducing, productivity-increasing sources of output growth complementary to existing labor–land resources in agriculture is an important implication of this view. Concern with methods of generating long-term increases in the agricultural surplus is leading economists to identify investments that offer large increases and to clarify the incentives and services necessary for reaping the potentially high output payoffs.

This agricultural surplus may be extracted through compulsion or through the market. Compulsion may be carried out directly by mandatory deliveries at low prices or indirectly by direct taxation which forces farmers to sell part of their output in order to pay the tax. A more common method is for the surplus to be obtained by free exchange of food for consumption and producton goods in the market. This method is free in the sense that no one is compelled to meet quotas or sell food in order to make tax payments [5].

Mandatory deliveries at fixed prices transfer real income directly from agriculture to the nonagricultural sectors in the form of larger quantities of food at lower prices. In the Soviet Union, collectivization facilitated enforced deliveries of food supplies adequate for urban needs [22]. In countries where the necessary degree of coercion is politically unacceptable, government price and procurement controls can still result in substantial collections at lower prices [11, p. 476]. When such policies discourage production and reduce supplies to the cities, retail price controls and rationing may keep urban food costs low in the short run but at the considerable risk of food shortages and inflationary pressures in the longer run.

Direct (land, income, personal) taxes will increase the agricultural surplus if farmers are led through income effects to produce more or through cash requirements to sell more. Ceteris paribus, the larger flow of marketed output will lower food prices and improve the terms of trade of the nonagricultural sectors [11, p. 466]. Taxes assessed on land or total output (income) can be expected to have the strongest impact, but they are also difficult to administer. The major unanswered question in regard to tax policy is the same one that arises consistently with regard to government price and related policies: What level of taxation of agriculture is feasible and desirable and what are the expected effects on production and productivity in the agricultural sector and in the economy generally [1, pp. 110–111]?

Of direct interest for this paper is the use of the market to obtain the agricultural surplus. A country must depend on market exchange of goods and services for food and raw materials if coercion is rejected and it is impossible to tax agriculture directly. This alternative draws attention to the supply of and demand for food as major influences on the growth path of the economy [5]. If the price elasticity of agriculture's offer curve is small, terms of trade favorable to nonagriculture will have little effect on the marketed supply of agricultural output. However, enlarging the surplus could require heavy government expenditures in production- and productivity-increasing investments to shift the agricultural supply function outward. If, on the other hand, the agricultural offer curve is price-elastic, the government is limited in its use of price, tax, and trade policies to favor industry. The agricultural surplus can then be extracted through terms of trade more favorable to agriculture, but less government investment may be required in agriculture as a result.

This brief review of major economic growth models suggests that government manipulation of the relative price structure is an integral part of growth policy. The (free) market-determined set of relative prices for final goods and factors may not be optimal from the point of view of development; conscious intervention is therefore necessary and justified.

Some suggestions of desirable directions for adjusting relative prices are given, but none of the models is sufficiently comprehensive to tell us what price structure would be optimal. In fact, most growth models are developed on the assumption of constant relative prices. How much intervention will the price system bear without resulting in an expensive misallocation of scarce resources? How can prices be used to improve incentives and efficiency within and between the agricultural and nonagricultural sectors? What changes in price structures are necessary and desirable as development proceeds? Seen in this way, the issue is not "squeezing" agriculture, or alternatively nonagriculture, but rather how prices can be used to organize the efficient utilization of resources consistent with overall development policy.

Almost every aspect of government price, tax, and trade policy does affect relative prices; but much more theoretical and empirical work is needed before the direction and magnitude of the "more desirable" and "less desirable" interventions are known. The great complicating factor is that prices unleash widespread substitution and income effects in production and consumption, and no set of prices will be able to satisfy the search for simultaneous net gains in all directions.

Prices and Agricultural Development

The problem of the relation of the price structure to economic development is extremely complex [2, p. 28]. There is first a basic question about what the appropriate price concept is. From received price theory we obtain the notion of a static equilibrium price structure corresponding to zero shortages and surpluses in all markets. The equilibrium price set may diverge from actual prices if some markets are in disequilibrium or some product or factor prices are institutionally determined. What imperfections exist and how they differ between countries and between stages of development are largely unknown. Moreover, there is no guarantee that equilibrium prices are the optimum ones for economic development. Externality is one commonly accepted basis for deliberately distorting prices in the interest of "balanced" growth. It may be true that hard experience has taught us that we cannot have an efficient growth policy without guidance from the market—especially in organizing and directing the large number of producers in agriculture—but it is equally true that we have not yet developed a basis for determining just what price structure will secure the most economic use of scarce resources in developing countries.

If we define an "efficient" pricing system in terms of the results it should achieve, an optimum price structure in a growth context would (1) allocate factors to insure that the largest output and optimum product-mix is produced, (2) insure that the desired goods are produced at optimum levels of cost and efficiency, (3) distribute goods to the "right" consumers at minimum cost and delay, (4) foresee future demand and supply conditions so that required goods and services can be efficiently produced at the appropriate time, (5) facilitate improvements in technology and productive structure in accordance with factor endowments and development objectives, and (6) achieve a satisfactory distribution of national income between producers and consumers and between sectors of the economy.

No price structure can do all these things at the same time. In practice, prices would have to be evaluated on the basis of weights attached to these alternative "objectives." We would need to know which ones are the most important and to what extent progress toward one objective would substitute for progress toward another. We would need to know what imperfections or distortions exist and how price policies can correct or compensate for them. We would need to know what nonprice policies can be used to supplement or offset undesirable consequences of price policies. Thus, price policies must be considered in the total matrix of economic and social policies; there is no unique and universal specification of an optimal price structure [2].

Agricultural price policies involve consideration of the level of agricultural prices relative to the general price level, agricultural prices relative to consumption goods and inputs purchased by farmers from industry, and the prices of agricultural products relative to each other. A complete policy would take all of these relationships into account. Although the basis for Krishna's pragmatic appeal for a modest policy affecting a few selected crops [9, pp. 525–526] is obvious, there is clear danger from unbalanced, uncoordinated intervention, especially when there is reason to believe that existing prices may be seriously distorted.

The growing emphasis on price policies reflects three types of evidence that is accumulating about the economic responsiveness or "rationality" of farmers in developing countries. First, producers have been shown to shift crop acreages in response to changing relative prices [3, 10, 15, 28]. The second is that traditional agriculture has been found to be "efficient" in the sense that factors are used in optimum combinations given existing techniques, factor availabilities, and prices [4, 26, 30]. The third is that farmers have been shown to adopt and use new practices and inputs that offer sufficiently attractive and certain rewards but to be reluctant to innovate when potential rewards seem uncertain and/or unattractive [19].

Yotopoulos has used his evidence that farming in one region of Greece is "poor but efficient" to advance the hypothesis that the economic motivation and operation of the market mechanism suggested by his efficiency finding are extremely favorable—and possibly necessary—for rapid farm modernization [30, pp. 26–28, and 223–224]. He outlines a hypothetical sequence whereby higher farm income due to increased product prices triggers saving and investment in new inputs and better methods.

This is an extremely appealing and hopeful hypothesis but one that has not yet been verified. We need much more information on income–expenditure patterns of farm families with different incomes, farm sizes, and types of farming. Also, the hypothesis assumes that locally proven new technology and methods are available, that inputs supplies are dependable and reasonably priced, and that there is a well-developed system of information and marketing services available to farmers. Few agricultures in underdeveloped countries are presently so well situated.

This consideration reminds us again that price policies do not stand alone. Their incentive effects will be realized only if complementary policies are followed which make it profitable for farmers to adopt and use available new technology. Neither are they necessarily costless; programs to improve prices can require large government expenditures and can use up scarce administrative resources. Both of these represent "real costs" in the sense of the possible alternative use of the financial and administrative resources for development purposes. In some cases, resources committed to improving incentives may be required to gain adoption of new technical inputs; in other cases, incentive programs may substitute for certain types of public investments. Much more needs to be known about these interdependencies and possible trade-offs [18].

Agriculture's Terms of Trade

Several additional aspects of the overall terms of trade between agriculture and nonagriculture merit attention. A country in a food-deficit situation will experience rises in food prices, ceteris paribus, since food demanded by consumers at constant prices will exceed quantities supplied at the same prices. Most commonly, the underlying situation is that food demand, reflecting population, income, and urban growth, is trending upward more rapidly than food output. If the government is unable or unwilling to let prices rise sufficiently to restore equilibrium in the food market, policies designed to restrain prices and close the "food gap" will be necessary. Rationing, direct procurement and distribution, subsidies, legally fixed prices, imports, and investments to shift the food supply functions are examples. Too often, the result has been to destroy farmers' incentives to produce more with improved techniques and more efficient combinations of new and traditional inputs [8, 9].

It is possible that demand and supply forces themselves will limit the extent to which a secular improvement in agriculture's terms of trade will occur. If the price elasticity of demand for food is relatively high, a gap between food demand and food supply can be closed with only moderate price increases. If the price elasticity is low, however, a strong secular increase in prices will accompany a deficit situation. Mellor has recently presented an argument supporting the proposition that the price elasticity of demand for food in low-income countries is near unity [16, p. 28]. He bases his argument on the homogeneity postulate and the familiar theorem that the sum of the own-price, cross-price, and income elasticities is zero for the demand of any commodity. A convenient relation for a two-good case (food versus nonfood) can be written:

$$e_F = K_F E_F + (1 - K_F)\, e_S$$

where

e_F is price elasticity of demand for food,
E_F is income elasticity of demand for food,
e_S is elasticity of substitution between food and nonfood, and
K_F is the proportion of consumers' income spent for food [29, pp. 74–76].

If the elasticity of substitution is positive but small, then the price elasticity of demand will equal or slightly exceed the weighted income elasticity. Mellor assumed an income elasticity equal to 0.8 and concluded that a price elasticity of 0.9 is "reasonable" [16, p. 29].

Mellor then analyzed a model of an economy with 70 percent of the population in agriculture, where per capita income for the nonagricultural population grows at 4 percent per year. Total population is increasing at 3 percent per year. He calculated that an increase in agricultural production of nearly 5 percent per year is required to maintain stable food prices. However, if food production does not increase at all, prices will rise only about 2.5 percent per year. Mellor concluded, "It is unlikely in the early stages of development that the domestic terms of trade will trend so radically toward agriculture as to create a major political problem" [16, p. 33].

Mellor's model is internally consistent even though several of its features are surprising and casual observation causes me to question its conclusions. Is the deduction of a price elasticity of demand near unity a reasonable one? The relevant income elasticity is for "basic food" (food grains?) supplied by the subsistence agricultural sector, not for total food, and so the coefficient may be as low as 0.5. If "basic food" on the average also constitutes about one-half of total consumer expenditures, then the equation above suggests that the price elasticity could be as low as 0.25. In this case, food prices would increase at nearly 10 percent per year if production were stagnant. I don't claim empirical validity for my coefficients, but the results possibly represent an "upper bound" in comparison to the "lower bound" presented by Mellor. Even if production increased sufficiently to hold the price rise to 5 percent per year, food prices relative to other prices would still rise by more than 50 percent in a decade, certainly a significant shift! The model also misses what may be the essence of the food pricing problem—the pressure for prices to move up in urban markets. If rural as well as urban population is increasing and food output is stagnant, the marketed surplus of food is likely to fall, causing urban food supplies to fall and prices to rise. Moreover, as food prices rise, both substitution and income effects will be generated on the food retained for home consumption in the agricultural sector. If the latter are strong, marketed output may fall still more. The net result could be falling supplies, growing excess demand in urban markets, and rapid increases in prices beyond the limit of political tolerance.

In any event, whether for secular or short-term reasons, many governments have undertaken programs designed to lower or restrain food prices and increase quantities supplied to urban populations. And almost every policy followed has had some impact on agriculture's terms of trade. We need more and better information on what shifts have taken place and what their effects have been on aggregate agricultural production. The measurement problem is not as simple as comparing time series of agricultural and nonagricultural prices. Many policies can be used to distort price structures to transfer income out of agriculture and to government, industry, or consumers. These include overvalued currency, multiple exchange rates, tariff and quantitative restrictions on imports favoring domestic manufacturing industries, taxes, procurement at low prices, and imports of food—P.L. 480 and otherwise—to keep domestic food prices low. In evaluating shifts in terms of trade, one should try to take account of all the relevant policies and estimate their quantitative effects.

Lewis has suggested that what is needed is a detailed investigation of relative prices of goods within the country compared with relative prices in international markets [11, p. 482]. He uses "implicit exchange rates" for this purpose, defining them as the ratios between domestic prices in local currency and international prices in foreign currency. Weighting the implicit exchange rates (P_k for agricultural commodities and P_i for industrial goods) by marketings of the agricultural sector, M_k, and the purchases of industrial goods by the agricultural sector, E_i, and taking the ratio of the average implicit exchange rate for agricultural goods,

$$\sum_k P_k M_k,$$

to the average rate for industrial products,

$$\sum_i P_i E_i,$$

gives the ratio of agriculture's domestic terms of trade to the terms of trade it would have in competitive equilibrium without trade restrictions [12, pp. 60–62]. Applying this method to Pakistan, Lewis found that, in 1954-55, farmers received only about Rs. 3.25 per dollar's worth of agricultural products sold but paid around Rs. 9.50 per dollar's worth of agricultural products that they bought. In the mid-sixties, agriculture was still receiving about one-third less per unit of output exchanged than it might under "free trade" [12, pp. 64–65]. Studies that do not try to take the total mix of price, trade, and tax policies into account may give a very poor picture of changes in the terms of trade, but few such evaluations are available.

There is little empirical evidence on the aggregate response of agriculture to changes in the terms of trade. The main sources of response would be more intensive utilization of land and labor resources already in agriculture and greater use of purchased inputs and new techniques. Employment and income-distribution effects would also be of importance and should be estimated and evaluated along with the production effects.

Price Policies for Selected Crops

More and more countries are adopting some sort of forward pricing to provide a measure of assurance to farmers that their use of new methods and inputs will be rewarded. These programs are most often designed to encourage the growth of output of basic food crops. There may also be a substantial element of income support involved if the crop is produced in a large traditional sector. At such time as the country is fortunate enough to meet its output targets, prices may also be used as an instrument to guide the output mix in accordance with projected national needs.

Unfortunately, many countries with announced price-support programs have lacked the willingness or financial and administrative resources to translate these guarantees into higher prices at the farm level. In consequence, guarantees have sometimes not been honored and farmers have lost confidence in the program. In other cases, lack of storage or inept administration have resulted in large financial losses from fulfilling price commitments, bringing the program into disrepute. Given the importance attached to price policies, it is surprising how infrequently the costs and benefits of existing programs have been calculated. It also seems obvious that too little attention has been paid to the types of agencies, programs, and procedures that would permit price policies to be carried out most efficiently under varying conditions.

The necessity for a price-support program is often not obvious. In a recent major analysis of price policies, Krishna focused mainly on countries where the rate of growth of effective demand is exceeding the rate of growth of output over the course of time; therefore, prices are likely to be under persistent upward pressure [9, p. 498]. In many such cases, stabilization programs designed to reduce intra- and inter-year price variations may be a more appropriate policy alternative. In fact, price stability may be as important for output promotion as price support and storage; marketing and outlook programs may offer more potential gains than direct price policies [7].

To increase output, price programs must influence producers' price expectations and producers must respond to the price incentives. If we assume that with no program, producers base their expected price on the previous season's price, then with a price guarantee, producers' expected price becomes

$$\overset{*}{P}_t = f(P_{t-1}, P_f)$$

where

$\overset{*}{P}_t$ is expected price at time t,
P_{t-1} is realized price at time $t-1$, and
P_f is the minimum price guarantee.

If, as an extreme case, realized prices were always above the guaranteed price, the price guarantee would not affect price expectations nor production. Its effect would be limited to serving as a form of "insurance" against price declines, which might encourage farmers to assume risks more readily and incur cash costs in the adoption of new technology.

A more important case is one in which the minimum price guarantee exceeds the expected market price. If the government monopolizes the market for the product and maintains the announced price, producers will benefit and respond to the higher price. Costs to the government will depend on the margin between the government's buying and selling prices. A dual "high-farm, low-consumer" price policy can involve high costs to the government. A "low-farm, low-consumer" price policy can discourage domestic production and encourage consumption and can force imports or rationing [8, 17].

Alternatively, the government may enter the market marginally to support its price guarantee. Now the proportion of output purchased becomes a policy variable. If a large enough quantity is purchased, all producers will receive the announced price. If budget constraints limit purchases below the guaranteed level, however, only some producers will receive the announced price and others will receive a lower "free market" price, creating a "two-price" situation. The two prices will remain as long as the guaranteed price is above the equilibrium level and government purchases are not sufficient to raise the "free market" price to the support level. Only those producers selling to the government will benefit from and respond to the support price [25].

Effects on consumers and costs to the government will depend on the disposition of the purchases by the public agency. If they are sold back into the domestic market, consumers will benefit through larger quantities at lower prices, but the "free market" price will fall at the expense of the producers who are not able to sell to the government. A more likely alternative is for the government to subsidize consumption of some consumers through direct distribution or controlled prices in selected outlets. This will raise costs to the government but, to the extent the total demand is raised, the price effects in the "free market" will be diminished.

Considerable controversy surrounds the question of the basis for fixing producer prices [9, pp. 517–526]. I seriously doubt that any one criterion can be selected or that the issue deserves the attention it has received. The price which is selected must depend upon the objectives of the policy, the distribution of the costs and benefits among producers, consumers, and the government, and the judgments by policy-makers of the appropriate trade-offs between competing objectives and between gaining and losing groups.

I suspect that a much more fruitful area is to seek ways of improving the geographic and seasonal patterns of price programs. Too often, governments are conducting purchase–storage–sale programs on the basis of zero transportation and zero storage costs [20]. Considerable loss in allocative efficiency and distortions in production and distribution can result from support prices not reflecting transportation and storage costs. The goal should be to seek price programs which provide stable price expectations at the desired level but without destroying the efficiency of the market in integrating and unifying national production and distribution.

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Discussion: Economic Policy and Agricultural Development Abroad

LYLE P. SCHERTZ

The papers by Schuh and Fletcher relate to important policy considerations. Schuh points out that we overlook many of the effects of general economic policies on agriculture even though these policies have often adversely affected agricultural development. Fletcher discusses the role of agricultural prices. He argues that more information, analysis, and re-

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LYLE P. SCHERTZ *is deputy administrator of the International Agricultural Development Service, USDA.*

search are needed. Thus, we are reminded that, however hard we may be trying, there is more that needs to be done.

There is much validity in Schuh's point that, as agricultural economists, we overlook the importance to agriculture of general economic policies in the developing countries.[1] The specialization implied in our professional title may have concentrated our focus entirely too much. This failure to consider the impact of general economic policies is often associated with limited attention to the policies of assistance agencies and their allocation of resources.

My discussion is divided into three parts. The first focuses on exchange rates—the subject upon which Schuh had originally planned to concentrate. The second part discusses the recent shift toward more emphasis on agricultural development. In many cases this shift has involved significant changes in general economic policies. The third part identifies some of the areas which are in most urgent need of more adequate research and analysis.

As Schuh points out, overvaluation of currencies and multiple exchange rates can adversely affect agricultural development. Many currencies of the developing countries are overvalued. For example, the black market premiums were greater than 120 percent in almost half of 69 free world developing countries in March 1967 [4]. These situations encourage the use of import controls and stimulate the use of multiple exchange rates.

Notable progress, however, has also been made in recent years in adjustments of exchange rates. The International Monetary Fund has pressed for the simplification of multiple exchange rates, and many multiple exchange systems have been simplified or eliminated. For example, Rice identifies seven P.L. 480 recipient countries that changed from multiple exchange rates in 1960 to single rates by 1966 [5].

De Vries reminds us that devaluation has been a frequent tool of developing, as well as developed, countries [1]. Furthermore, the developing countries as a group have more fully offset their domestic price increases with devaluation than have the developed countries. From computations of the ratios between actual exchange rates and the rates which would have been required to keep pace with inflation in the 1948–1967 period, it was found that the developing countries with relatively strong and even chronic inflation had relatively low ratios. Developing countries with moderate inflation had a ratio of 121, whereas the ratio for industrialization countries was 141.[2]

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[1] There are important exceptions to these general tendencies. See, for example, Falcon [2].

[2] These estimates do not mean that currently existing rates are at equilibrium levels. Considerations other than prices influence exchange rates. And the year 1948 was not a year of equilibrium.

Unfortunately, Schuh does not present an empirical analysis of the effects of exchange policy on agricultural development. An analysis of developments such as those just cited would have helped correct the very deficiencies in research on general economic policies which he cites.

Schuh quite rightly points out that many countries, in their general and agricultural economic policies, are giving evidence of increasing concern for agricultural development. In selected countries, prices of farm products have increased, price support schemes have been implemented, inputs have been made more readily available to agriculture even at the expense of the allocation of precious foreign exchange at the most favorable exchange rates, research has been expanded, and Ministry of Agriculture budgets have been increased. Also of great importance, national leadership has in some cases begun to associate its prestige with agricultural programs and to demand that scarce government management capacity be focused on the improvement of agriculture. These changes have involved adjustments in general economic policies, as well as in policies more directly related to agriculture.

The situation in India illustrates the increased concern for agriculture in the face of continued need for further changes. Agricultural prices have increased and a price support program is in existence. But prices are plagued with the internal food zones preventing the free movement of grain [3]. Almost 13 million acres of high-yielding varieties of wheat and rice were planted in 1967-68, up sharply from very small acreages as recently as 1965-66. But irrigated area could become an important restraint to expansion.

There is much yet to do in India and many other countries have done much less. One country spends less than 2 percent of its national budget on agriculture. Another spends more on its president's annual trip to western Europe than the entire budget for the Ministry of Agriculture.

One of the most important reasons for the increased concern over agricultural development was the recent food crisis of many Asian countries. It had a tremendous impact on political leaders and their followers. Another important reason was the availability of high-yielding varieties of wheat, rice, sorghums, and in some areas corn. Leaders in industry, as well as farmers, realized that the potential return from investments in agriculture had increased. The yields, two and three times those of traditional varieties, markedly changed the profitability of water, fertilizer, and machinery.

In the past it would have been helpful to political leaders as they launched agricultural programs to have the analyses called for by Schuh. However, there are still many problems related to general economic policies which beset efforts to stimulate agricultural development. Three areas occur to me to be of great significance.

1. *Food price policy.* In the developing countries, prices of farm prod-

ucts have been oriented to consumers. The objective has been to make food available at lowest possible prices. Recently some countries have been formulating programs to assure farmers of minimum prices. The effects of general economic policies on these efforts, as well as the influence of these programs on industrial development, need studying.

2. *Foreign private investment.* Farm economists in neither the developing nor the developed countries have focused sufficiently on the effect of foreign investments on agricultural development. In this country we take for granted the role of a very viable agribusiness industry. In many of the developing countries the need for agricultural supporting industries is not recognized. Articles by farm economists focusing on these issues are conspicuously scarce.

3. *Fiscal policy.* A large number of less-developed countries depend heavily on export and import taxes for their government revenue. A long list of countries in which these impediments exist could be compiled. Only recently have some countries, such as Uruguay, Paraguay, India, and Thailand, begun to reduce these duties. The implications of these changes and further adjustments need analysis.

There are many other general economic policies which merit our interests and efforts. Our response to these needs could substantially affect the attainment of increased economic growth of the developing countries.

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Discussion: Economic Policy and Agricultural Development Abroad

ROGER W. FOX

A basic contention of Professor Schuh's paper is that agricultural development policies and programs should be judged on their ability to increase per capita income rather than on their output-increasing potential. Although he acknowledges that the two goals are not mutually exclusive, he prefers the emphasis on income rather than physical output. I find this

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ROGER W. FOX *is assistant professor of agricultural economics at the University of Arizona.*

orientation appealing. Professor Schuh then briefly discusses a few policies that may or may not lead to the simultaneous attainment of both goals. The strong implication is that more research and thought concerning the impact of specific programs on per capita agricultural income are necessary. I agree!

The major focus of Professor Schuh's paper is on certain general economic policies directed toward industrialization, which he argues have hindered the growth of agricultural income. The emphasis is on trade policies and programs, with only a limited consideration of credit and fiscal policies. Is the emphasis on trade policies out of proportion? Are there other areas of general economic policy—such as transportation policy, price policy, military policy, education policy, and employment policy—that have likewise impeded the growth of the agricultural sector? I raise these questions without attempting to give specific answers. I do sense an imbalance or an incompleteness.

According to Professor Schuh, devotion to the above policies and programs has led to five important adverse consequences with respect to the agricultural sector. Except for the adverse impact of exchange rate policy, little argument or evidence is offered to establish the cause-and-effect relationships between the general economic policies and the consequences for agriculture. The specific consequences cited seem to be more a function of inappropriate priorities and poor planning. Consequently, except in the case of exchange rates, it is not clear how modification of existing policies will affect the agricultural sector.

A major conclusion of Professor Schuh's paper is that developing countries should attempt to increase the efficiency of their agricultural export sector. I would agree that some countries have stressed import substitution at the expense of export expansion. However, any expansion of agricultural exports should be based on a clear comparative advantage and not on a fabricated one. Furthermore, because of the continued prevalence of agricultural protectionism in the developed nations, the difficulty of finding export markets should not be overlooked. Finally, the tendency of export industries to result in dualism or enclaves may mean that the income objectives for the agricultural sector are realized by only a small part of the agricultural population. For example, contrast the export-oriented agriculture of northwest Mexico with the poverty conditions of agriculture in the central region or with the traditional peasant producer in the northwest.

Professor Fletcher was confronted with a difficult task in preparing his paper on price policy and economic development. First, there have already been some excellent papers on the subject (such as Raj Krishna's contribution [2] to the recent book by Southworth and Johnston), thereby making it extremely difficult to say anything new. Second, the subject is quite broad and could include pricing of numerous products and services: for example, credit, land, labor, foreign exchange, primary products, and consumer products. Professor Fletcher has limited his discussion to the pricing of agricultural products.

One of the important points of Professor Fletcher's paper is the clear implication that in dealing with price policy it is not possible to obtain Pareto-optimum solutions. In his words, "No set of prices will be able to satisfy the search for simultaneous gains in all directions." Welfare losses will be encountered; therefore, policy makers and administrators will be forced to attach subjective weights to conflicting and competing objectives.

I feel that Professor Fletcher should have placed greater emphasis on two points he briefly mentioned with respect to price policy. The first one is a strong warning that the manipulation of product and factor prices can lead to serious inconsistencies and disequilibrium. Granted, economic growth implies disequilibrium forces in action, yet price policies that lead to excess resources (for example, land) in one sector or fail to provide the proper incentives, can eventually produce serious adjustment problems. Witness the stifling effect of the high fertilizer–rice price ratio in Indonesia, or the chronic adjustment problem facing U.S. agriculture in the past two decades. Moreover, we must not ignore the political and administrative rigidities that accompany price fixing.

The second and related point concerns the criteria for price setting. Little attention is given this difficult problem. Krishna addresses himself to this issue; however, D. Gale Johnson [1] rejects the complete average cost criterion that Krishna adopts. Obviously, further discussion of alternative criteria is required. Leaving this decision to administrators is not likely to be satisfactory.

It is interesting to note some of the areas of agreement, disagreement, and differences in emphasis between the two papers. Professor Schuh has stressed the potential role of exports in the devlopment of agriculture. On the other hand, Professor Fletcher, in discussing the contributions of agriculture to economic growth, fails to refer to agricultural exports. I would argue that exports should be considered; their main contribution is foreign exchange, thereby providing for the capital imports necessary for the development of the economy. However, as previously implied, I am not prepared to emphasize their role as much as Professor Schuh.

Professors Schuh and Fletcher agree with respect to labor absorption problems in the nonfarm economy. The former admonishes current development-planners and policy-makers for not being aware of the employment impacts of certain programs which they advocate. The latter notes that labor surpluses associated with rapid population growth can lead to a double stress: namely, the need for increased food output and increased job opportunities. This problem has been recognized previously, particularly with respect to unemployment in India; however, I am not informed as to the policy and program changes, if any, resulting from this recognition.

A final point resulting from my comparison of the two papers relates to the concern about per capita income on one hand (Schuh) and price guidelines on the other (Fletcher). I merely want to re-emphasize a well-known fact, derived from U.S. experience, that price policy will not necessarily lead to the desired income goals. Consequently, a low-income country, in pursuing a program of higher prices for farm products and/or lower input prices, should not automatically expect the low-income problems of their farm population to be solved. Professor Fletcher recognizes this situation when he refers to the need to consider price policy within the "total matrix of economic and social policies." Problems of income growth and distribution will be critical and will require special attention. In fact, some price programs may aggravate the income distribution problem.

Finally, the call for empirical research on which to base programs is loud and clear. In reading these papers, I have noted four major areas in which the authors felt that more information was necessary:

1. Estimates of price elasticities of demand both in the aggregate (for example, food and nonfood) and for individual commodities. These estimates are needed at the domestic consumption level and at the export level. Such estimates might settle the differences between Fletcher and Mellor concerning the price elasticity of demand for food.
2. Estimates of supply elasticities in terms of acreage response, quantity response, and marketable surplus response. Again, by commodity or groups of commodities. Professor Schuh's paper contains one such estimate with respect to Brazilian corn production. Krishna's article [2] summarizes the results of a number of acreage response studies.
3. Estimates of the terms of trade between agriculture and nonagriculture, and the impact of changes in the terms of trade on such things as production, consumption, and exports.
4. Estimates of trends in income distribution and the impact on income distribution of various government programs.

It is clear that this type of information is needed before one can seriously design and advocate an effective price program.

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FOREIGN TECHNICAL ASSISTANCE

CHAIRMAN: LOWELL S. HARDIN, THE FORD FOUNDATION

Agricultural Economists in Overseas Development Assistance and the Impact Upon U.S. Universities*

HAROLD D. GUITHER AND W. N. THOMPSON

SEVERAL studies have appraised technical assistance programs abroad, with the works of Adams and Garraty [1], Weidner [10], and Cleveland, Mangone, and Adams [4] among the best known. Agricultural economists have recognized the need to make international work a part of the profession but have expressed concern over the impact of university–AID contract program involvement on the U.S. university and the professional careers of individuals. Several articles have appeared in this journal, and Association presidential addresses have often pointed up problems in international assistance [2, 6, 11].

A research team commissioned by Education and World Affairs to study international programs of five major universities called for evaluation: "The time is long past for a thorough analysis and assessment of what the university contract system has and has not accomplished toward overseas development goals and toward the academic development of American institutions" [5, p. 272]. The three-year CIC–AID Rural Development Research Project that was completed in June 1968 has attempted to do this for the university agricultural AID contracts. The University of Illinois part of this project has emphasized the impacts on U.S. universities, the results of which are reported elsewhere [9]. It is the purpose of this paper to focus on the role of agricultural economists in university–AID contract projects and assess the impacts of this involvement on U.S. universities.

The CIC–AID Rural Development Research Project was a study of the efforts of 35 U.S. universities on 68 AID contract projects in 39 countries

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HAROLD D. GUITHER *is associate professor of agricultural economics and* W. N. THOMPSON *is professor of agricultural economics, both at the University of Illinois.*

from 1951 to 1966. The primary objective of 49 of the projects was improvement or establishment of a degree-granting institution. Improvement of ministry-related research, or extension, or secondary-level or technical training in agriculture were objectives of 26 of the projects, including 9 of the degree-institution-building projects. Four of the projects were action programs aimed to increase agricultural production.

On the 68 projects, 1,399 staff members served overseas for one month or more, with the most common length of overseas service being two years. Fifty-seven percent were faculty members of the contracting university immediately prior to the contract project assignment. An additional 16 percent were recruited from other universities. A total of 140 agricultural economists[1] served on 51 of the 68 projects. Data were obtained from university project files, mailed questionnaires, and interviews.[2]

The Role of Agriculture Economists

On university–AID contract projects, one agricultural economist usually serves as a member of a team of five to ten members. In a few instances two or three agricultural economists served simultaneously on a project, usually where they were involved in advisory or research work regarding government policy and planning in addition to assistance in developing a degree-granting institution. On the 51 projects on which agricultural economists served, 27 included an agricultural economist during the first year of the contract operation. An additional 9 projects had the first agricultural economist assigned during the second year of the project. Thus, university–AID contract projects have tended to emphasize the technical agricultural disciplines. One-fourth of the projects did not include an agricultural economist among their personnel and nearly as many had the services of an agricultural economist only after the second year of the project.

Contract team members

The agricultural economist, like other university–AID contract team members, has served in the so-called advisory role to one or more host country national counterparts. This has been described as a "vague and uncertain role" in which the newly recruited staff member had poor prior knowledge of the functions to be performed overseas or the expectations of his professional colleagues during and following the overseas assignment [8].

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[1] Includes six rural sociologists.

[2] Questionnaires were returned by 598 contract team members and team leaders who had returned from overseas service, 315 wives who had accompanied them, 336 colleagues of those who had served overseas, and 141 department heads. Agricultural economists among the respondents were returned team members and leaders, 70; colleagues, 79; and department heads, 25. Returned staff members, department heads, and college of agriculture and university administrators were interviewed on 32 university campuses.

The responses from agricultural economists confirm that there was initial vagueness and uncertainty about the objectives of the overseas project as well as about what they were to do. In many cases, an agricultural economist had not previously served at the host institution. However, the many things to be done and the shortage of personnel demanded that agricultural economists serving on AID contract projects cover several areas of the field of agricultural economics and step beyond the role of adviser in the interest of making progress.

With the predominance of degree-institution projects and the demands of students, course and curriculum development and classroom instruction had first call on the time of most agricultural economists. Most of those at educational institutions actually taught courses as well as advising one or more counterparts. Some taught classes to demonstrate effective methods of instruction and student evaluation. In some cases, teaching responsibilities were shared with a host-country national.

With the participant training component in most university–AID contracts, selecting host-country nationals for training is an important role played by agricultural economists in cooperation with host institution administrators and contract team leaders. Many have advised on administrative matters and library development. Some have acted in roles similar to those of department heads in U.S. universities.

Agricultural economists on AID contract assignments reported that they spent an average of 34 percent of their time on research, with the full range from zero to 100 percent. Twenty-five percent reported spending 60 percent or more of their time on research, 29 percent spent from 40 to 59 percent of their time on research, and 46 percent spent less than 40 percent of their time on research.

Research activity by overseas agricultural economists at universities most frequently centered around advising on graduate student theses and helping host institution staff members set up research projects. Usually this was done concurrently with teaching assignments. Some taught courses in research methods to graduate students and held seminars for staff members. Very few, however, conducted research on their own without a host-national counterpart.

Some agricultural economists have conducted research in a government ministry to aid in national planning and economic development. The economist serving in such a role usually conducts research with the help of host-country nationals and also advises and counsels with government officials on policy and program development. Persons in such positions usually spend a higher proportion of their time on research than do agricultural economists at universities.

Extension activity by agricultural economists overseas takes varied forms but it has involved fewer people than teaching and research. A few agricultural economists have worked with the ministries of agriculture, conducting training sessions for extension workers, helping set up demonstrations, and counseling with extension officials to develop improved extension programs.

Where universities have taken responsibility for extension, the agricultural economist may be assigned a role as adviser for teaching, research, and extension in a specific area, such as farm management. In such situations, the extension activity usually involves assisting a host-country staff member in program planning and organization and conducting extension meetings. In a few cases, the agricultural economist carries on public service and extension activities, including education of government officials on the values of higher education or research.

The agricultural economist in his adviser–consultant–extension role may advise district or state officials on local problems such as credit, resettlement, cooperatives, agrarian reform, marketing, or price policies. He may also collect data for bench-mark studies and evaluation of changes in agriculture. In addition, he may conduct training courses or seminars in specific areas, such as agricultural credit or farm management.

Consulting assignments of from one to three months provide a specialized role for a few agricultural economists. Usually these assignments are part of a contract that employs a team of staff members on assignments of two or more years. The short-run consultant goes to carry out a limited but specific assignment that he can reasonably hope to complete in the allotted time. He may assist with a special research project such as developing a regional planning model, or he may advise on certain government policies. He may work as part of an evaluation or survey team, or conduct a short course or a series of seminars.

Agricultural economists have had to demonstrate flexibility and resourcefulness as a result of circumstances at the overseas location. Some have arrived to find that they had no counterparts, or after a few months their counterparts have left for other jobs. A single counterpart could spend only a limited amount of time with the U.S. adviser or may have resisted the idea of needing advice from a foreigner. The needs for an agricultural economist seemed to be different after arrival overseas than before leaving the U.S. Some who went to advise teachers undertook teaching courses themselves. Others established extension-type demonstrations. Some who had developed a specialized interest at home became generalists to fill in where they were needed overseas.

Contract team leaders

More than a proportionate share of agricultural economists have served as contract team leaders compared with those in the agricultural technical fields. About one-fifth of the team leaders were agricultural economists but only about one-tenth of the team members were economists. A number of deans of U.S. colleges of agriculture and administrators of international agricultural programs point out that agricultural economists generally have more breadth of knowledge than do those in the technical fields. The education and experiences of agricultural economists encourage them to think in terms of efficient use of resources to attain project objectives.

Agricultural economists who served as team leaders reported that they spent 15 percent of their time on research, primarily in research administration, not active involvement in a research project. Similarly, team leaders spent little time in teaching classes although they were usually thoroughly enmeshed in policy considerations of curricula development, grading systems, and improvements in teaching and student and staff evaluation.

Department administration

Agricultural economics department heads, as well as those in other academic departments, were involved very little in the early years of technical assistance contract programs. For the most part, contract decisions were made by college and university administrators. Department heads might be asked to assist in recuiting overseas staff members but recruiting might be done directly by the dean of agriculture or the AID project campus coordinator. In too many instances the department head's primary role has been that of solving, as best he could, the problems of personnel and domestic programs created by the departure of one or more of his staff members for an overseas assignment. A part of this responsibility was protecting a position for the staff member upon his return at some indefinite time.

The vague role of department administrators in international program administration in the early years and the fact that the early practices have tended to persist in many universities have created a serious lack of enthusiasm and support at the department level for AID contract programs. Fortunately, some university and college-level administrators recognize that it is virtually impossible to develop strong long-term overseas programs without support of department administrators and faculty. Yet one-half of the agricultural economics department heads had not visited the overseas project on which members of their staff had served.

International program administration

Of 28 land-grant universities with active technical assistance contracts in mid-1967, an agricultural economist or rural sociologist was playing a key role in the administration of these programs on nine campuses. The director or coordinator of international programs is responsible for working with administrators and faculty to develop agreement and support for international activities, gain support of department heads and faculty for proposed future projects, coordinate program decisions at home and overseas, implement contract agreements, and facilitate the transfer of available resources at home to the needs of the project overseas.

The Impacts on the U.S. University

Department administration and programs

Some of the most difficult decisions faced by department administrators relate to handling work while staff members are overseas. They have used a variety of methods of handling the absent member's work because one method was not feasible in every situation.

In agricultural economics departments, 72 percent of the department heads reported that they divided the work load among others in the department without adding new staff, a much higher proportion than other department heads reported. Forty-eight percent also reported that (1) they assigned work to other staff members and obtained additional help from graduate assistants, and (2) they hired new full-time staff in anticipation of vacancies or new positions. Forty-four percent stated that they closed out part or all of the absent staff member's activities. Thirty percent reported bringing in visiting staff members.

About one-third of the agricultural economists who served on AID contract programs reported that the work they had under way before leaving was interrupted and much time and effort was lost as a result of their departure. Department heads confirm this situation. As was noted above, 44 percent reported that all or part of the activities of staff members were closed out.

To show the effects upon the quality of work, colleagues of agricultural economics staff members who had served overseas were asked to rate the work done by their replacements. Performance by replacements was rated less effective or inferior in teaching by 56 percent, in research by 49 percent, and in extension by 73 percent. Agricultural economics department heads confirm the views of their staff members on performance of replacements of overseas staff members. Forty percent said teaching was less satisfactory, 47 percent rated student counseling and extension work less satisfactory, and 68 percent rated research less satisfactory.

The more experienced staff members who remain at home may acquire additional work loads such as committees, student counseling, and special assignments. Eighty-three percent of the agricultural economics colleagues surveyed believed that this had happened. Twenty-two percent of the colleagues and 32 percent of the department heads responded that assignment of work from persons going overseas to others interfered with the professional growth of staff members who must do this work.

Graduate students may also be affected. About two-thirds of the colleagues agreed that shifting responsibility for graduate students from persons going overseas to others presents significant problems for these students. The biggest problems occur with the supervision of graduate student research.

Conflicts between international and domestic programs show up in the way staff members view the attention that the department head gives to each area of work. Although only 4 percent of the department heads felt that overseas projects resulted in less time spent on domestic programs than desirable, 28 percent of the colleagues surveyed expressed this view.

As a result of involvements in overseas contract programs, 36 percent of the agricultural economics department heads stated that they had changed their basis for selecting new staff members. Sixteen percent now expect that most new faculty members will be willing to serve overseas sometime, 12 percent look for men with overseas experience, and 32 percent look for staff members with international interests.

As a result of staff members' being involved in AID contract projects, universities incur substantial costs in terms of less satisfactory performance of domestic work. Present funding of contract work on a year-to-year basis does not permit the department to add long-term personnel to strengthen its international competence without seriously impairing the work oriented primarily toward domestic needs.

Careers of individuals

The role played by the agricultural economist may affect his career and his future services to the U.S. university. About one-fourth of the agricultural economists surveyed who had not been overseas believed that a foreign assignment is likely to detract from a man's professional advancement. The agricultural economist who takes a foreign assignment is also apprehensive about its professional implications; about one-half who returned home after one two-year assignment listed concern for professional recognition and contacts as an important reason for their decision.

Overseas experience may affect a man's abilities to teach, do research, and carry on extension work. A majority of the returned staff members, their colleagues, and department heads agreed that overseas experience contributed to more effective teaching upon return. Some gained a broader perspective in their field of interest. Some improved their teaching methods as a result of working with students who had a limited knowledge of English; others learned a foreign language. One returned agricultural economist commented, "When you teach in Spanish, you hunt harder for the key ideas and sharpen your ability to separate the most important from the less important." However, fewer returned staff members, colleagues, or department heads believed that overseas experience contributed to more effective research and extension work after return.

Getting readjusted to work on the campus can be a serious problem for some returning staff members, but evidence suggests that fewer agricultural economists have adjustment problems upon return than other university staff members. Eighty percent of the agricultural economics department heads stated that adjustment time for their returned staff members was six months or less; 20 percent stated it was more than six months. Sixty-seven percent of other department heads said that their staff adjusted in six months or less; 33 percent said that they required more than six months. Returned staff members are more optimistic than their department heads about the amount of time they need to readjust to campus work. Although 48 percent of the returned staff members believed that they readjusted in one month or less, only 19 percent of the department heads thought so.

Training and experience of an agricultural economist may provide good background for the key role of contract team leader. But the contribution of team-leader experience to the professional career of an agricultural economist is questionable. With a few exceptions, agricultural economics department heads or chairmen have not served as contract team leaders. The agricultural economists who have served have usually been individuals who have demonstrated administrative ability but have not served in administrative positions. Experience as a team leader has not been recognized as experience to qualify a person to administer an agricultural economics department, although a few team leaders have moved into international program administration. If the team leader returns to teaching and research, he faces certain frustrations during a period of reorientation and redevelopment of his capabilities as an agricultural economist.

Foreign student training

Agricultural economists have recognized that they have a role both at home and abroad in training foreign students. Witt [11], Blackmore [3], and Lewis [7] have discussed the need to recognize the different cultural and educational backgrounds of these students and to train them for working in their own country.

About 7 percent of the 2,360 foreign participants trained under rural development contract projects from 1952 to 1966 have studied agricultural economics. More emphasis has been placed on training plant and animal scientists up to this time.[3]

However, in terms of all foreign students' training, agricultural economics departments have received more support than other departments. Forty-eight percent of the agricultural economics department heads reported receiving funds for foreign student assistantships and training programs; 22 percent of the other department heads received funds for this purpose. Part of this difference is due to support of agricultural economics training from sources in addition to AID.

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[3] Data on participants from 58 projects in 38 countries: 25 percent and 15 percent of participants were in plant sciences and animal sciences, respectively.

The agricultural economist who returns from overseas plays a larger role in the work with foreign students. About one-half of the returned agricultural economists reported that they did more foreign student counseling, supervision, and instruction upon return.

The major impact of foreign students upon departments of agricultural economics appears to result from three major problems as reported by department heads: the need for more counseling than the American students, lack of proficiency in English, and inadequate preparation in basic courses. Students also face adjustments to a new culture and often lack proper work and study habits. In addition, departments face problems in providing office space.

International programs

Agricultural economists have had opportunities to use their overseas experience to a greater extent than other agricultural scientists. Among agricultural economics department heads, 56 percent reported that their returned staff members had developed new courses and 40 percent stated that they had modified old courses. Sixty-four percent reported that returned staff members had contributed to university area studies programs. The percentage response from all agricultural department heads was only about one-half as much as from agricultural economics department heads.

Yet despite these signs of feedback into the department and university programs from overseas projects, the data also show that there is much room for improvement. Only 33 percent of the agricultural economists stated that they had an adequate opportunity to report their experiences, observations, and recommendations to university administrators; 46 percent, to college of agriculture administrators; 41 percent, to college faculty and staff; and 70 percent, to others interested in an assignment overseas.

Personal interviews confirmed that many administrators do not appreciate the wealth of experience and potential that contract staff members bring back with them. Only a few administrators make a conscientious organized effort to "debrief" returning staff members and capitalize on the experiences gained to strengthen the international dimension of the university program.

Nearly one-half of the returned agricultural economists expressed disappointment that the university had not recognized their overseas experience as evidenced by assignments which they had been asked to take since returning. However, in most university departments, funds have not been available to finance the increased international interests of those who return.

On very few campuses have AID funds been made available so that a returned contract staff member could continue to provide services to the overseas project as part of his home campus assignment. Some of the most productive opportunities for returned agricultural economists have come when the department received funds from foundations or other non-AID sources. Such funds have enabled the agricultural economist with overseas experience to develop research projects that contribute to overseas development and to develop further the international dimension in his professional career and in the academic department.

In terms of the feedback achieved by universities in their international programs, we would agree with one report which concluded, "It is easier to put the feedback process into words than it is to bring it about. In a sense, to lament the absence of feedback is merely another way of noting that a major university is large and complex" [5, p. 271].

Summary and Recommendations

The AID–university institution-building contract has usually been strongly oriented toward service to an overseas educational institution without providing the means by which the contracting university could develop competency to implement and support the project for the 5, 10, or 20 years needed to do the job. With few exceptions, the contracts have not provided funds for U.S. university campus-based research related to the project. As a result, the contracts have offered limited opportunity for universities to develop staffs who could continue to service and staff these contracts. Future programs should provide for a research component that will contribute to building the professional capability of the university staff to carry out overseas projects, and the capacity of the department to provide staff when needed.

Department programs and administration

To staff and support international activities, most agricultural economics departments need a better-organized, well-planned program that will integrate the demands for services of agricultural economists, the efforts to maintain and develop the supply of professional staff who can perform the services needed, and requests for funds to get the job done.

Those departments of agricultural economics which have made the most progress in strenthening the international dimension in research and teaching and their capability to support overseas projects have received funds from foundations and other non-AID sources, in addition to participation in their university's overseas AID contracts.

University administrators and the staff members who implement the projects have often not understood the institution-building process and its relationships to the overall technical assistance program. Although the research in this area has centered with political scientists, sociologists, anthropologists, and public administrators, the agricultural economist who works in international development activities should develop an understanding of and perspective on institution-building and technical assistance in traditional cultures.

Achieving feedback from the overseas experience into the ongoing campus activities remains one of the most serious problems confronting administrators at the university, college, and department level. Only a few systematic efforts are being made to do this on university campuses. Some returned staff members have been asked to take assignments related to their foreign experience. Others become frustrated and disillusioned because they feel that they have not had adequate opportunity to use their overseas experiences. Agricultural economists on some campuses have been more successful than other agricultural scientists, however, in being able to contribute to international activities. The participation in university area-studies programs, research projects, and development of courses with an international dimension are noteworthy examples.

On the home campus, administrators of agricultural economics departments should face up to the responsibility of making international work an integral part of the department's work. For international work to be fully recognized, the department head's role will include these responsibilities:

1. He will assume an aggressive role in planning the agricultural economics program of the overseas project, working with international program administrators. This will require intimate knowledge of project objectives and conditions and the spending of some time at the overseas project location.
2. He will be responsible for selection of agricultural economists to staff overseas contract positions. The work to be done overseas will be planned to attain project objectives, strengthen the department's international program, and contribute to the career development of the individual.
3. He will be aware of what his overseas staff members are doing, what their needs for technical support are, how effectively they are doing their jobs, and how their experiences will fit into the work of the department when they return.
4. He will recognize the special need for management of overseas personnel in terms of appraising their performance for equitable promotions and salary adjustments in relation to other staff members. He may need to develop criteria for evaluating overseas staff different from those that he has used previously.
5. His department will assume responsibility for training foreign students and university faculty members, who may come as part of the over-

seas contract project or under other sponsorship. Foreign students' training should be made more applicable to their home country conditions, combine theory with practical applications, and provide more guidance concerning how they can use their training when they return to their jobs at home.

Career development

In addition to service on AID–university institution-building contracts, agricultural economists have participated in other international projects involving research, teaching, consulting, and administration. In all their overseas assignments, individual agricultural economists and their administrators should take positive steps to make the overseas assignment contribute to career goals and on-campus programs. These could include specific definition of the role and duties during the overseas assignment, arrangements for professional contacts through professional meetings and travel to nearby countries, and use of graduate assistants and short-term consultants at the overseas project location.

As much as possible, the agricultural economist should actively participate in the work overseas through teaching and research that will be professionally challenging and enable him to stay current with new developments in his field. Advising and counseling with host-country counterparts is important, however, so that they can eventually assume their proper role.

Length of overseas assignment should be determined by the types of jobs that need to be done as well as the best interests of the individual and his department. For some, two years may be just right; for others, four years or longer may be needed. However, short-term assignments of one to six months for agricultural economists have a place in the overseas program. Those who have been on two-year tours of duty can also make special contributions on follow-up assignments of one to three months.

A look ahead

The agricultural economist should play an expanding role in future rural development assistance projects. He can provide the necessary knowledge and skills in precontract and feasibility surveys; in the important policy decisions that establish national goals for agricultural development and related institutions in education, research, and service; and in implementing various development projects in both the public and private sectors. To be successful, he must have a thorough knowledge of the economic principles and sociological setting that made our American agricultural development possible, plus the ability to adapt these principles to different cultures and the economic, social, and political systems of developing countries.

Changes in production technologies will add new dimensions to the role of agricultural economists. For example, the increased production of wheat and rice achieved with use of new varieties and fertilization will be accompanied by new demands on transportation systems and marketing facilities and a reappraisal of pricing policies—areas in which agricultural economists can contribute. As a profession we should be alert to the changing needs for development assistance.

Financing will continue to be one of the major uncertainties in the development of international work at universities. The future role of agricultural economists, as well as other agricultural scientists, will depend largely upon how well the American public understands the magnitude of the world's food problems and supports the role of the United States in their solutions.

Perhaps our greatest challenge lies in assuming aggressive leadership to gain public understanding of technical assistance efforts. Agricultural economists can play a special role in explaining the resources being used, the expected benefits overseas and at home, and why the American public should support the increased commitment needed.

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Discussion: Agricultural Economists in Overseas Development Assistance and the Impact upon U.S. Universities

RAY BILLINGSLEY

Professors Guither and Thompson have given us an interesting look into the anatomy of agricultural economists serving with overseas contracts. They are concerned with a question often debated in academic circles: Do overseas contracts aid or hinder the operation of an individual department? Their paper and the larger CIC–AID report on which their paper is based are mainly an opinion survey of the groups most intimately associated with AID university contracts. These include the contract staff, their colleagues, department heads, AID/Washington officials, university administrators, and host-country participants. Although these opinions are interesting and throw much light upon problems confronted in this area of the universities' activities, they need to be coupled with insight and, where possible, more specific, quantifiable information.

In addition, I am sure that interesting case studies could have been developed from many university contracts. Almost all overseas projects have, at some time or other, had serious problems associated with them. Everyone acquainted with overseas projects knows of instances where individuals have been booted out of a country or sent home early, or the whole project cancelled by the host country. Case studies of these instances would be revealing and might be helpful in avoiding pitfalls in the future, not to mention the additional spice it would have lent to the report. It seems to me that the authors in their project should have looked into these cases to see whether or not any difficulties could be avoided. Without an objective, analytical approach in studying these problems, we are left with gossip and hearsay, which cannot be considered an appropriate method of project evaluation.

One important problem that was given only scant attention in the report was the feeling that people may either fall behind or be left out if they take overseas appointments. There were no concrete indications in the report to substantiate this so-called isolation effect, but the very fact that many people feel that it exists is relevant whether it is true or not. If it does exist, it is relevant to question whether or not this needs to be the case. Some of the reasons why people may fall behind is that when they become involved in an overseas contract they not only lose out on important committee and research assignments but also many times are removed from the scene almost to the extent of resigning. They are no lon-

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RAY BILLINGSLEY *is associate professor of agricultural economics at Texas A&M University.*

ger kept on mailing lists and are not involved in university or professional activities in the way that they are if employed on the university campus or even within the state. As soon as an individual leaves, many of his colleagues start referring to him in the past tense. In this process he loses contact with the university and with his colleagues and may become a "professional drop-out" (the term applied to Galbraith when he went to India). The situation would be inevitable, perhaps, if we were operating in an age of sailing ships, but it does not need to occur in the jet age. This isolation effect may happen in spite of the fact that the assignment is closer to the university campus than many of the meetings attended within the continental United States.

An opportunity for beneficial impact on the university, not mentioned in the report, would be for graduate advisors to become more involved in the research work that the foreign student should be doing in his home country. Most university contracts do not make provision for research projects to be carried out in the student's home country. In addition, provision should be made for American students to become involved in overseas contract research. Some university contracts now allow for research associate positions, but for the most part these have not been carried out very successfully. One reason for this may be that participation in this type of project usually requires the student to be in the foreign country so long that it extends his graduate training period. My experience with a project in the Dominican Republic has shown that students can contribute towards the research needs of the foreign country, yet spend less than two or three months in the foreign country. Many people raise their eyebrows when this is suggested, but as a matter of fact we don't expect a graduate student to live for one or two years in the area of his research interest in this country, so why should he in the foreign country? He usually is expected to spend time in the area only for orientation and for gathering of data, with all of the planning for the research and the analysis being done back at the campus.

Another area where significant impact is made by many overseas university contracts, but not mentioned by the authors, is in the number of graduate students generated and the research that they do. These graduate students are available for use on research projects, and although there are special problems associated with the foreign students, it is also true that for the most part the country is providing its most talented and progressive youth for study and research at the American university. This being the case, these people contribute significantly to the graduate student research that is done in many departments. For example, at Texas A&M, our graduate foreign student ratio in agricultural economics has varied recently between the ranges of 25 and 50 percent. By any standard this graduate student research represents a considerable investment in human capital, and the first returns from this investment are realized by the university.

Finally, the universities engaging in the overseas contracts are in a position to reap considerable prestige for projects which are universally considered a success and in a like manner subject to severe discredit for any projects which fail. The more the university administration and AID/Washington know about the kinds of problems associated with overseas university contracts, the more likely will be the possibility of avoiding serious problems. Everyone associated with these projects, as well as all others only indirectly concerned, would like to see the failures minimized.

Both Guither and Thompson are to be commended for the information they have provided us, but after reading their paper and the larger CIC–AID report, I can't help but feel that they learned much more than they have told us so far. Maybe we need another session to find out how it really was.

Why Overseas Technical Assistance Is Ineffective*

RALPH A. LOOMIS

WHY is overseas technical assistance ineffective? The task of answering this question is analogous to zero plus one second in the blast-off routine of modern rocketry. So little time has elapsed that the normal clarity of hindsight is obscure, leaving only a blurry evaluation of the success or failure of the journey. We aren't even sure that all the jets have ignited. Yet more serious, there is grave doubt that the target of our technical assistance journey has been adequately identified and articulated to permit the use of any but the crudest corrective measures. Nevertheless, the importance of the mission dictates that we use our best efforts to evaluate and improve on our performance.

The organization of my paper entails first some working definitions, second, a brief historical perspective within which the effectiveness of technical assistance must be evaluated, and finally some notions on why the effectiveness of our overseas technical assistance effort has fallen short of expectations, with some suggestions and attendant implications for modification.

Terms and Concepts

Thorstein Veblen wrote that the "exposition of the obvious is a tedious employment, and a recital of the commonplace does not hold the interest of readers or audience" [17, p. 411]. But assumptions about the seemingly commonplace often result in a breakdown in communication. Definition of a few particularly germane terms and concepts will minimize misunderstanding or misinterpretation as mere euphemisms, slogans, and clichés.

Though intellectually stimulating and potentially fruitful, to search for the meaning of progress in the affairs of mankind is not the purpose of this paper. Rather, let us simply note that there is an increasing sense of egalitarianism in the world today, and the key to progress is viewed as possession and generation of modern knowledge. But we should also note that not all change is viewed as progress. Many are questioning the capability of man to adjust to ever-increasing rates of change. Be this as it

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* The views expressed here are my own and not necessarily those of the U. S. Department of Agriculture. A previous draft of this paper was improved by comments from colleagues, including Leroy Blakeslee, Paul W. Barkley, C. Dirck Ditwiler, Olen E. Leonard, Walter L. Slocum, Myron E. Wirth, and Clifford H. Zuroske.

RALPH A. LOOMIS *is an agricultural economist with the Economic Research Service, stationed at Washington State University.*

may, the implicit goal of aid is to assist the less modern to become more modern.[1]

Modernization (development) is analogous to Westernization, specialization, commercialization, industrialization, urbanization, individualization—all this and more. It embraces all human activity: intellectual, political, economic, social, and psychological. *Aid* (not AID) involves the many forms of preferential treatment afforded the less-modern countries by the more-modern countries and international organizations. It includes such things as grants, loans on favorable terms, sales of capital and consumption goods on preferential terms, sharing of technological knowledge, technical assistance, P.L. 480 activities, Peace Corps efforts, and military assistance. *Technical assistance* has come to mean people-oriented programs designed to transfer knowledge through education, training, and research. The focus is on changing the behavior of individuals and institutions.

The *social system* is the aggregate set of a people's rules through which they relate or link to one another. *Culture* is comprised of the feeling–conviction–belief systems of human interaction, which in turn largely prescribe the individual's reaction to the broader social system. The components of the social system (and a part of culture) are known as *institutions*. They are the instruments of the social system [1]. This conceptualization of the social system, along with role, position, and sanction, is a static concept at a point in time. But of particular relevance here is the dynamic notion of social process whereby these parts interact. Individual behavior both is influenced by and influences the social structure. An understanding of this social process and of a society is essential to an overall evaluation of technical assistance effectiveness.

For purposes of this paper, the *effectiveness of technical assistance* is the contribution that technical assistance makes to the process of development or modernization. To measure this effectiveness would necessitate the establishment of an intricate set of criteria and standards, a challenging task that is largely beyond the scope of this paper.

It is useful to conceptualize modernization processes as interaction between physical and social systems of human activity. The physical transformation process encompasses the familiar concern of economists, namely, the production, distribution, and consumption of wealth. Linkages between the physical transformation process and the social process are much less familiar. We tend to forget that the social system prescribes the human relations and rules that control the use pattern of physical resources. Without reference to the social system we cannot explain human behavior, and thus why a given society chooses a particular pattern of physical resource use.

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[1] National security is often posited as the "real" goal of our assistance. As a nation and as people, we have many motivational sets and subsets behind our assistance efforts. In this paper I elect to use modernization as a primary goal.

It is obvious that both the quantity and quality of inputs in the physical transformation process will have a direct bearing on output. Furthermore, the quality of inputs, particularly the human input, is largely determined by the social system. And it is, after all, people who determine the combinations of all inputs. Moreoever, the output both is affected by and affects social relationships. Development as a process occurs when the physical and social aspects of inputs and outputs are all interconnected in effective combinations [12].

Historical Perspective

The major world struggles of the modern era center on the issue of how nearly 200 diverse countries can organize their political, economic, and social systems to gain the benefits of modern knowledge. The problems are compounded by the fact that no two of these political entities (1) are simultaneously at the same level of modernization, (2) share the same pattern of institutions, (3) have the same ideas on problem definitions or resolution, nor (4) view the same time path for future development.

At the same time there are emerging international trends that have mixed blessings for the modernization movement, for they facilitate change but simultaneously add to its urgency and instability. With the emerging international culture it is becoming increasingly evident that (1) scientific explanations of the natural order and the products of science are resulting in a common map for the educated everywhere, (2) the application of science to military technology and the relative (in terms of history) bipolarity of power politics commands a worldwide concern for the means of settling national differences, (3) awareness of the benefits of technology to health and comfort is reulting in demands for fulfillment of expectations heretofore undreamed of, or suppressed, and (4) codes of responsible conduct, basic minimum respect as human beings, a movement toward individualization in place of tight communal organization, and the spread of egalitarian ideas are being accentuated [6].

It is in this setting of instability and transition that the United States is striving to identify and maintain its role as a relative newcomer to world leadership. The transition to modernity is inevitable in some form, and the precise form it takes will be critically influenced by what the United States is and what it does. However determinedly we may practice nonintervention, the character and actions of the United States influence all societies in transition. Our policies can help shape the direction of that influence. We cannot withdraw into neutrality.

The route followed by the transitional societies will depend ultimately on the realistic options which the influential leaders of the modernizing societies see open to them. One option is the preservation of many features of the traditional society, maintenance of the existing power structure, and general resistance to forces of change. A second option is the radical destruction of the existing fabric of society and its replacement by something entirely different. The third option, and the one that embraces the very essence of our purposive intervention, is the gradual modification of the social structure, institutions, and cultural values in the direction of modernization while retaining enough of the traditional cohesive features to prevent debilitating internal upheaval [16].

This, then, is the challenge before us—to assist in the realization of an evolutionary pace toward modernity. Progress that is too slow to match growing aspirations will produce an achievement gap that will likely end in the rapid and chaotic destruction of existing patterns before new ones can be formed—a condition of normlessness.

Technical assistance is only one component of out total aid to support proponents of the third option. To attribute progress, or lack of it, solely to technical assistance is naïve. Moreover, aid in any form will be ineffective unless there is an internal process of development for it to facilitate.

So what has been the response to meet these challenges? Net official public aid expenditures[2] of all the wealthy nations (including "centrally planned" countries) averaged about $6.7 billion annually during the period 1961–1965. For the 1956–1965 decade, member countries of the Development Assistance Committee (DAC),[3] which account for about 90 percent of all economic aid, provided over $50 billion in net aid expenditures. The United States' share was 58 percent of this total, or nearly $30 billion. Another $13 billion was provided in the form of military aid (excluding the Viet Nam War) [5].

A recent study published by the DAC indicates that the total net disbursements of public and private aid continue to increase. In 1967, the DAC countries' net aid expenditures for official bilateral aid were $6.2 billion; there was $4.1 billion of private bilateral aid; and $1.05 billion of both public and private aid was made available to multilateral agencies, for a total of $11.4 billion. Nearly half of this total ($5.6 billion) came from the United States [13].

Another gross measure of aid, and one that is more directly relevant to the technical assistance component of aid, is the number of people working abroad and the number of students and trainees being financed by technical assistance programs. According to Kaplan, the DAC countries had about 82,000 technicians and teachers abroad in 1963 [4]. Approximately 20,000 of these were elementary school teachers from France alone. In the same year there were 42,000 students and trainees being financed by DAC countries. In 1967, the United Nations agencies had over 8,000 technicians serving in the field and awarded over 7,000 fellowships to students and trainees [14]. Looking only at the United States picture, in 1967 we had 7,865 technicians employed abroad and were financing 6,729 students and trainees [15].[4]

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[2] Disbursements of public funds for economic grants and loans (maturity of one year or more) to less-developed countries and to multilateral agencies, minus repayments of principal [5].

[3] Development Assistance Committee (DAC), is an agency of the Organization for Economic Cooperation and Development (OECD). Members: Australia, Austria, Belgium, Canada, Denmark, France, West Germany, Italy, Japan, the Netherlands, Norway, Portugal, Sweden, the United Kingdom, and the United States.

These gross numbers are impressive. Yet the United States aid expenditures constitute about 0.5 percent of our Gross National Product. The number of "technicians" in the program is an even smaller percentage of the professionals and technicians in our system. Moreoever, during the past decade nearly one-third of our net expenditures for assistance have been directly for military purposes [5].

Effectiveness of Technical Assistance

It would be relatively easy to build the case that our tools of analysis are woefully lacking and that the application of the tools which we do have has been so wanting as to preclude a documented evaluation of technical assistance effectiveness. Similarly, there are those who maintain that while our effort at technical assistance is far from perfect, the world would be significantly worse off without it, and so they conclude that it has been effective—a view based somewhat on emotional zeal but one which contains the seminal notions of a set of testable hypotheses.

The fact is that we not know how effective our technical assistance has been in contributing to the modernization process. But we do know that after more than two decades of aid experience, the development problems facing the world are still overwhelming and of increasing urgency. The emerging process of evaluation should involve seeking answers to questions of (1) the appropriateness of kind, form, or content of assistance, (2) the magnitude of assistance, and (3) the means and efficiency used for transmittal. Effectiveness will be jeopardized if any one or a combination of these is inappropriate.

We postulate that a causal relationship exists between technical assistance and modernization, but we simply do not have factual information to guide an analysis. Therefore, at this point in time we must rely largely on judgment in evaluating the effectiveness of technical assistance. This is true with respect to each of the three broad dimensions of aid: (1) content, (2) magnitude, and (3) means and efficiency.

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[4] These data are in terms of numbers of individuals, not man-years.

In stating reasons for ineffectiveness, I will assume simply that there is room for improvement. Comparative study of successes and failures can be fruitful, but that is not my mission. It will be obvious that there are unavoidable overlapping connotations among the reasons for ineffectiveness.

1. The major content of our technical assistance has been cast in the mold of physical technology. We have emphasized the technical and physical knowledge of the modern era, in spite of the fact that our experience indicates that problems of modernization are deeply rooted in the social, political, and cultural aspects of the modernization process. It has been estimated that at least two of three technicians working overseas in 1967 were physical scientists. This disciplinary emphasis is similar among foreign students and trainees coming here under technical assistance sponsorship.

Even if we assume an effective job of transmitting modern technical know-how, it will fall on sterile soil unless there is a corresponding political receptivity, set of social structures, and cultural beliefs and values to facilitate the adaptation and application of the modern technical knowledge. As a matter of fact, unless the social system is conducive to development, no amount of assistance with respect to physical technology will bring it about. On the other hand if the dominant social, political, and economic systems are conducive to modernity, the transfer of technological know-how can be expected to be effective. Such a system will gradually generate the institutions, interpersonal relations, and incentives that will facilitate the use of modern physical technology.

2. Though we talk of pluralism, our actions are largely characterized by a uniform policy of transmitting our technology intact to others. The manifestations of this monolithic approach to technical assistance are many. We have assumed that the technological knowledge that has worked for us can be transplanted to all less-modern societies with equal effectiveness. We have used a single recipe (technique transmission) as a solution to diverse and complex problems. The magnitude of the modernization process and the diversity among societies has made it difficult to particularize for the specific and different needs of each.

Physical resource endowment and the degree or level of modernization at a point in time are of particular relevance to technical assistance program design. The capability to respond to and utilize modern technological knowledge will vary significantly among countries that differ in each of these respects.

The slippage between the intent of broad aggregate policy, however rational and altruistic, and the realities of implementation is a universal problem of large organizational size. There is a resulting tendency to consider only the lower cost of uniformity and standardization, while failing to cosnider the overall benefits–costs relationships. The content, magnitude, and timing of the resultant technical assistance is likely to be inappropriate and the means inefficient.

3. The effectiveness of our technical assistance effort is frequently reduced or nullified because of resistance to acceptance on the part of recipients. The manifestations of this rejection vary all the way from being subtly (or not so subtly) ignored to being refused acceptance or even expelled. There are many deep-seated and varied reasons for this rejection. Some of the more critical reasons are as follows:

a) To a considerable extent the process of modernization for the poor countries involves imitation of the wealthy. Imitation is seen as an act of submission and a proof of inadequacy. The very *presence* of technical assistance personnel implies an inadequacy on the part of the host. This sense of inferiority leads to resentment. Substitutes for self-confidence and self-esteem are created in the form of faith, pride, and strong nationalistic feelings. These acts of illusion, potent words, and flaunting defiance are often mistakenly viewed as complete rejection, when, in fact, they may be as essential to reform and modernization movements as technical training [3].

b) This same presence of technical assistance personnel implies change. Significant change is always accompanied by shifts in power, status, influence, and economic wealth. The cry of "intervention" is evoked at the suggestion that in order to enter the modern era changes must occur in patterns of wealth, ownership, and income; the breakdown of communal social structures; the substitution of systems of reward based on performance for those based on inherited station in society. These are forces behind the subtle and not-so-subtle rejections of assistance. Some of these attitudes are based on well-founded suspicion with roots in a long history of exploitation by the indigenous "privileged" class and foreign powers.

c) The administering of technical aid is largely a person-to-person activity—an art. Interpersonal conflict between the specialist and his host can destroy any possibilities of success, regardless of the applicability of the knowledge in question. The motivations, interpersonal skills, and attitudes of technical assistance personnel and host personnel are equally crucial to effectiveness.

4. It is true that political support here at home for financing overseas assistance is enhanced if results can be recorded within months, or at most within one or two years. This is also true in the low-income countries. These political pressures at home and abroad lend support to assistance efforts that have seemingly high payoffs within short time periods. Similarly, types of assistance that require perhaps decades before payoff

becomes evident are unlikely to receive enthusiastic political (and hence, financial) support either at home or abroad.

This political reality of the need for day-to-day evidence of accomplishment leads to an imbalance between the support for short-run and for long-run assistance efforts. The modernization process is primarily a long-run process involving education, research, and social change. The never-ending chain of immediate short-run issues is detrimentally competitive with the less spectacular long-run jobs of orderly and progressive reform. Effectiveness of assistance is thereby impaired.

5. In our technical assistance efforts to induce change, we have used primarily a multidisciplinary technique, where a number of different disciplinary specialists view the same problem independently. With the exception of economics, most of the disciplines in technical assistance work have a physical science parentage. Nevertheless, the recommendations of each independent viewer are generally microscopic and unintegrated. They are not integrated with the recommendations of other specialists, nor with the interdependent ramifications for the total and interrelated physical and social process of change. This difficulty of disciplinary integration is a major source of ineffectiveness.

Suggested Modifications for Technical Assistance

If the impact of technical assistance on the modernizing countries is not effective because of some fundamental philosophical, sociological, political, and psychological shortcomings as postulated above, what can be done about it? Is it feasible for us to support actively any but technological reform?

We are presently seeking answers to these questions, though primarily in the political arena, where there is the ever-present danger of generating more heat than light. Most certainly, introspection is always in order, and partículularly so for policies with worldwide implications. But a word of warning! The Thomas theorem tells us that "if men define situations as real, they are real in their consequences." Merton draws a sociological parallel from this, namely, that "public definitions of a situation (prophecies or predictions) become an integral part of the situation and thus affect subsequent developments" [8, p. 423].

The danger in introspection about the effectiveness of our technical assistance is that, because of the lack of factual information and the immensity and long-run nature of the problems of attaining modernity, we may convince ourselves that the case is hopeless when in fact it is not. This pattern of the self-fulfilling prophecy, generated in ignorance or emotion, could result in grevious errors of policy before knowledge could be gained for making a more rational decision.

This reasoning becomes, then, the basis for the first priority of business in answering the question: What can we do about it?

1. The cause of technical assistance would be fortified by its separation from other forms of aid. In our own society we have a long tradition of giving liberal support to education, training, health, and research. There is reason to believe that increased support would be given to this international cause if it were not so closely identified with more politically volatile forms of aid. Separate identity would facilitate long-run commitments, thereby permitting much improved program design and personnel staffing. Along with separation, it may be prudent to change the name of technical assistance to "international education," which is more commensurate with the scope of the job ahead.

2. There is need for greater emphasis on social assistance to complement our present physical assistance. Knowledge of the sociology of development is in its infancy compared with the technology or even the economics of development. The social scientists, including economists, must help create the educational and research institutions that will enable these societies to generate their own social, economic, and political systems commensurate with their growth in technological knowledge. Although they may gradually superimpose applicable technology from the modern nations, it is necessary that they evolve their social system from within. Only in this way can they attain the self-esteem, self-respect, and sense of worthiness so essential to the realization of man's potential growth.

While assisting in the creation of educational and research systems, we must be cognizant of the fact that their needs will likely differ from ours. Rather than emphasizing knowledge creation, it may well be that the "development university" should emphasize knowledge transfer. Hopefully, also, the developing nations will strive to give guidance to the meaning of this technical and economic capacity being set in motion and to enlarge the human relevance and humanistic goals of these secular advances [11].

3. We need to do a better job of orienting our technical assistance specialist for the realities of his assignment. The recent work of Rigney and McDermott is the best I have seen that is directed toward this end [9, 10]. Their work focuses on the importance of quickly establishing respect for one's professional competence, of gaining the confidence of one's indigenous peers, of blending research and consultation, and similar person-to-person relations that should not be taken for granted in the orientation process. The specialist should also, prior to his assignment, be a serious student of the country he is to serve.

All this suggests the desirability of creating a corps of career development specialists. Such an institution would overcome many of the reasons for ineffectiveness that are associated with inadequacies in person-to-person relationships, short-term assignments, or the necessity of recruiting high-paid misfits because they are the only ones available. A career corps would attract more qualified people, for they would not have to pay the professional price now associated with "leaves of absence." However, as Lewis points out, there is still a functional role for the brief (but well-planned) visit of outstanding specialists [7]. Perhaps this role would be even more effective when combined with the experienced corps specialists.

4. We need to do a better job of propagandizing our cause of the general welfare of mankind. Hoffer points out that our chief handicap in bidding for the souls of men has been our lack of words [3]. By and large, these words must come from the intellectuals, professionals, and scholars, for words from the "men of action" (politicians, businessmen, industrialists) are suspect. If the intellectuals have a share in shaping and executing development policies, they will be more likely to defend them.

This task must involve not only the intellectuals of our society but also, and even more importantly, those of the less-modern countries. This suggests the importance of carefully seeking out the individuals and groups in these societies whose ideas of reform, progress, and viable long-run programs coincide most nearly with ours. Ways must be found to support these groups, for they can be most effective spokesmen for the requirements and changes associated with modernization.

5. During the past two decades we have exposed thousands of foreign students and trainees to a learning experience within our borders. Moreover, we have sent thousands of scientists abroad in technical assistance activities. Through these associations we have taught, formally and by example, some of the knowledge, values, and social elements associated with a modern society. Although not all of this knowledge is directly transferable to the many different levels of development throughout the poor countries, some of it surely is.

One of the opportunities of capitalizing on the past (and future) investments in cross-cultural experience is to explore means of supporting the individuals and groups that have learned something about the needed changes for development. Rather than deplore the fact that many students are essentially unemployed or underemployed upon returning to their native countries or that they become subject to the "brain drain," we should incorporate within our assistance program the exploration of means whereby we can support their potential contribution in their homeland. Such an approach would simultaneously have the effect of (*a*) supporting modernization from within, and (*b*) reducing the undesirable incidence of the "dual-standard" criticism so frequently leveled at high-paid foreigners.

6. At yet another level of influencing the minds of men, it is essential that we demonstrate and encourage respect among mankind, regardless of formal education, occupation, wealth, or social status. An effective job of

breaking down traditional communal structures, and stimulating the process of individualization and the emergence of the autonomous individual, is dependent upon a sense of confidence, self-respect, and self-reliance. This is a long-run process, indeed, but it can be stimulated through education that emphasizes objectivity, cause and effect, and science. Only occasionally do we witness the purposive practice of this fundamental essence of modernization [7]. But it is through this process of individualization that the traditional social organizations, institutions, and cultural constraints are gradually dissolved and replaced by science and by the social and occupational mobility that are so vital to the dynamics of the modern era.

Some Implications

The above listing of reasons for the ineffectiveness of technical assistance and the suggestions for modification are only a modest representation of direction. Much more could be said from knowledge already available, and much more is yet to be learned. For example, I have not included the pros and cons of unilateral versus multilateral technical assistance; the technical assistance that is carried on apart from our nationally sponsored technical assistance program; the work of the Peace Corps; or a regional versus individual-country format for technical assistance.

Having gone the route of first employing only material aid, later adding physical technical aid, and finally including the ingredient of abstract and theoretical economic models, we now seem to be faced with the long-run problems of education, training, and research—primarily through institution- and "people"-building. This phase of assistance to the poor countries will place increased demands on our social science disciplines. We need to launch an intensive research effort designed to evaluate the effectiveness of our technical assistance program. What are its strengths and its weaknesses, and how can it be made more effective in facilitating modernization processes? The activity under the CIC–AID investigation of the institution-building process is a step in the direction of seeking answers to this question [2].

As scientists we are obliged to do a more thorough and objective job of identifying goals, seeking means to realization of these goals, and evaluating the performance of these means as they unfold. We are further obliged to formulate and test hypotheses of alternative forms of "aid." For example, what is the benefit–cost relation of "aid" through reducing the barriers of trade between the poor and the wealthy countries? To what extent would increased trade facilitate economic development from within? To what degree could it substitute for the present forms of economic assistance? Some assert that such a policy plays into the hands of the status quo classes, but there is increasing evidence that even they are not immune to the forces of change from within. In the final analysis, such an "aid" policy, or other alternatives to be investigated, may prove to be both more effective and less costly than our present policy.

Unless we are willing to become more serious about the job of goal definition, critical problem identification, and analysis of alternative ways of contributing to the modernization processes, we may be well advised to withdraw completely from assistance efforts. Surely we can use our wealth to good advantage in rebuilding our cities at home. In essence, Congress is now in the mood of withdrawal. We must either demonstrate the wisdom of long-run viable development programs or withdrawal will happen by default.

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Discussion: Why Overseas Technical Assistance Is Ineffective

MELVIN G. BLASE

This paper will be divided into two parts. Initially, specific points in the Loomis paper will be discussed. Subsequently, with a view toward extending the Loomis analysis and expanding the analytical framework suggested by Professor Schultz, a conceptualization of the technical assistance process will be presented. The latter will be used to elaborate several items in the initial discussion.

Discussion of the Loomis Paper

Clearly, the first thing to attract the attention of a reviewer of this paper is its title. It certainly accomplishes its objective of being provocative by being couched in such negative terms. However, as suggested later, not all technical assistance is ineffective—some of it is highly effective. Although the paper subsequently suggests that there is a continuum over which effectiveness can range, the title, nevertheless, is somewhat misleading.

Loomis' contention that the "target" or goal of technical assistance has not been adequately identified and articulated is quite valid. All too often, when identified, it is in terms of physical facilities. More frequently, both the representatives of contractors, such as universities, and the donor agencies have been reluctant to commit themselves to specific goals, for very different reasons. The consequence is the opportunity for conflict, which all too often characterizes technical assistance efforts.

Although the point is well taken in the Loomis paper that the development of a set of criteria for judging the effectiveness of technical assistance is beyond the scope of the paper, a problem of definition remains. Specifically, the definition of *modernization* appears too broad to be operationally useful.

Turning to the hypotheses explaining why technical assistance is not attaining its possible maximum contribution, one can find much with which to agree. Loomis is asking some of the relevant questions. His first conten-

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MELVIN G. BLASE *is associate professor of economics at the University of Missouri.*

tion is especially valid if one assumes that the objective of the technical assistance effort is institution-building. However, there are also political presences and substitute resource projects.[1] With respect to these, the social scientist may have a relatively small comparative advantage. All of this merely emphasizes the need to specify the prime objective of an assistance effort.

The second hypothesis concerning the monolithic approach to technical assistance has several dimensions. As one looks at AID–university contract teams worldwide, for example, one sees a surprising amount of similarity in the staffing patterns. In suggesting alternative strategies for staffing and other aspects of technical assistance, Warnken has made a significant contribution [Philip F. Warnken, "Strategies for Technical Assistance," in the *Final Report* of the CIC–AID Rural Development Research Project, Contract AID/csd–840, Columbia, University of Missouri, July 1968]. However, with respect to the uniqueness of national value systems, a note of caution is in order. Some customs may be straw men which will melt when subjected to dramatic results as a consequence of change initiated by technical assistance personnel. Again, one wonders if goal specification is not an important concern.

The third hypothesis concerning resistance offered by recipients suggests the need for new tactics, if not new strategy, in technical assistance. Past reliance on the single counterpart procedure, for example, is both extremely expensive (few universities can afford a one-to-one student–faculty ratio, even for their graduate students) and runs headlong into the problems perceived by Loomis.

The pressure for fast payoffs, dealt with in hypothesis form, is very real. Again its importance looms large when institution-building rather than political presence or provision of substitute resources is the objective. There is an education job to be done both at home and abroad concerning (1) the need for emphasizing institution-building projects relative to the other types, and (2) realistic expectations concerning time to pay off. If we in the academic community do not assume this responsibility, the job may not get done.

The fifth hypothesis, focusing on the difficulty of disciplinary integration, can best be dealt with in the next section of this paper. The conceptualization of technical assistance in institution-building is helpful at this point, as well as for amplifying some of the points discussed earlier.

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[1] The former includes projects in which importance is placed on maintaining channels of communication and representation, whereas the latter encompasses projects in which technical assistance personnel perform functions that would be accomplished by indigenous personnel if available. In neither type of project is emphasis placed on leaving as a residual a viable, autocatalytic host institution. Distinction among these types of projects is essential if the problem of double standards in evaluating project performance is to be avoided.

A Conceptualization of the Institution-building Process

Technical assistance personnel engaged in projects whose prime objective is institution-building would be well advised to view the process of which they are a part in a systems context. The system is multiphased and multilateral and produces multiproducts.

The system outputs are (1) current services, such as college graduates, research findings, and adult education activities, (2) institution-building components[2]—the main dynamic recursive element in the system as it cycles through time, and (3) influence, both to create a favorable climate for the utilization of its current services in the economic environment and to develop an expanded base of support for the host institution. In economic terminology, these multiproducts constitute the production possibility surface which is the ultimate objective of change by technical assistance inputs into the system.

One of the tasks of the technical assistance person as a change agent may be to disturb the equilibrium in this multiproduct mix. This is not simply a matter of seeking new points of tangency between the surface and price ratios. The latter, in fact, do not exist in most cases. Rather, it is a matter of generating new preference functions in key decision-makers in order to change the shape of their indifference surfaces.

So much for outputs. Now let us consider the inputs into the system. As suggested above, the system is multilateral, with inputs flowing both from the environment of the host country and from the technical assistance complex. These inputs take the form of budget, commodities (such as equipment), and technicians. These raw resources, however, do not directly result in project outputs but rather are transformed in a multiphased transformation process.

The first-phase transformation process, Subsystem A, involves the combination of project inputs from both sources with the stock resources of the host institution. These, referred to as action variables, are comprised of the composite will,[3] opportunity,[4] and means[5] of the host institution. This transformation process results in seven intermediate products. The services of these functional characteristics of the system are leadership, internal structure, doctrine, program, linkages, technology, and resources. These intermediate production functions must be modified if institution-building is to occur. The output of these functions, however, is intermediate rather than final for the system. These seven intermediate products are consumed in Subsystem B, which is characterized by the three production functions inferred above in the description of the multiproduct nature of the project system.

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[2] These are analogous to the intertemporal plow-back made by firms to expand their capacity for future production.

[3] *Will* is defined as the collective knowledge of, desire for, and acceptance of means of change by the host institution.

[4] *Opportunity* has both objective and subjective dimensions.

[5] *Means* include strategy, technology, and other resources, mainly physical.

Clearly, this conceptualization of the institution-building systems process provides a view of their assignments which few mono-disciplinary scientists have. Not only does this suggest the importance of Loomis' fifth hypothesis but also it has implications for the training program which he proposes as a remedial measure. Further, it suggests ways of conceiving new strategies and new staffing patterns and provides a more realistic framework for generating expectations than that used in the past. However, it is not a panacea. I quite agree that further research in this area is needed. This is especially so at a time when budget constraints force a new search for new ways of accomplishing institutional change directed toward the creation of autocatalytic institutional vehicles for development. Likewise, the complexity of the institution-building process which we are now beginning to perceive suggests the merit of establishing a technical assistance foundation which could reap some of the fruits of a division of labor among forms of assistance. Such a foundation, functioning jointly with universities and other legitimate technical assistance institutions, could provide an opportunity for career personnel in this field. The reason for singling out universities at this point is the need for integrating participant training in an institution-building strategy. However, most existing training programs need to be modified if indigenous institution-builders are to result. Not only should course work be offered in institution-building but also continuing backstopping assistance should be provided when the trainees begin functioning in their home institutions.

Returning finally more directly to the Loomis paper, I have found much more with which to agree than to criticize. However, lest I be misunderstood, let me emphasize that his list of hypotheses is not an all-inclusive one. Technical assistance will not be optimally efficient if these five areas are only tinkered with; the problems are much more complex. For example, improvements are needed also in such things as backstopping in general and recruiting in particular, use and selection of participant trainees, strategic use of executive visits, identification of the role of the donor agency, formulation of team strategy, elimination of overreporting in the face of undercommunicating, team leader identification and training, and macro analyses of country needs. In spite of these complexities, I believe that Loomis has made an admirable start in dealing with the problem to which he has addressed himself.

AGRICULTURAL INDUSTRY AND ECONOMIC DEVELOPMENT

Economic Development Through Agribusiness Consortia

RONALD O. AINES

THE basic hypothesis of this paper is that more low-cost output is needed, particularly in the developing countries, and that its production is economically and technologically feasible provided that the elements of both the private and the public sectors pertinent to each situation work together. First I want to present five situations to establish a common ground from which we can launch into the mental construction of what the dictionary defines as "an international business agreement or combination," namely, an agribusiness consortium. I would like to borrow from Secretary Freeman the phrase, "It's only a crust of bread." Wouldn't this be a great world if all the people of the world could take this attitude when they have a poor crop, "Oh, it's only a crust of bread"?

Situation I—More Production Needed

The gulf that exists between peoples of the world, the gulf between affluence and poverty, is a tragedy that will not persist with its present dimensions. The gulf is bound to continue to be closed. The pertinent question is the degree to which it will be closed by a vast improvement in the lot of the poor, or by a decline of the West.

Situation II—Production Within Countries with Need

A study of history and extrapolation of the past would suggest that Western civilization will decline as all others have done, leaving only the questions of when and at what rate. But we are in possession of things that did not exist in other eras, namely, the capabilities of science and the spirit to organize in order better to utilize the results of scientific investigations. The scientific and technological revolutions have created self-generating economic growth in the developed countries. The question is how science and its practical companion, technology, can be transported, adapted, developed, and used in the developing nations. The developing nations cannot be subsidized indefinitely for their needs, nor can they afford to import all of their needs, although with growth in their domestic production, growth in trade is essential. The basic economic answer is increased efficient production and trade.

RONALD O. AINES *is corporate research economist with the International Minerals & Chemical Corporation.*

Situation III—Efficient Increases in Production Require a Package of Many Inputs

The resources most readily available in the greatest quantity in developing nations are land and labor. Significant increases in efficient production require the bringing together, in the right proportion, of a large number of physical inputs and require the existence or creation of a broad spectrum of supporting infrastructure. No one private or public entity can most effectively accomplish this pull together alone. Rather, all must work together, each carrying out its appropriate functions. Governmental and nonprofit organizations must take strong positions in influencing effective regional planning, developing infrastructure, and organizing situations for change. Business must realize that it can "do well" by "doing good." The production and marketing technology needed for rapid increases in agribusiness output is available in many cases, but optimum business and financial systems of organization are often not creatively applied. Also, political goals and economic development goals are often in conflict.

Situation IV—Conflict Between the Nationalistic State and Minimum Cost of Production Goals

A basic conflict exists between the goals of the nationalistic state and optimum regional economic development that would be dictated by the minimum cost curves of industry. Each small developing nation wants the security and income of having a small production plant of each type within its own borders. International industry could provide products at lower cost in many cases, with fewer large production plants designed to provide products to all the small countries in a region of the world. What is the answer? There are several. The development of "common markets" helps. Subregional complementation pacts for selected industries can be an interim step provided that there is adequate cooperation by both the public and the private sectors. A major obstacle to regional development of industry concerns ownership and thereby control. Countries are suspicious of foreign ownership and control. Broader geographic financing, as well as ownership and control on a multi-nation basis of multi-national corporations having management with a truly worldwide point of view, should increase the acceptability, by each nation, of companies with operations in many nations.

Situation V—Development of an "Acceptable" Worldwide Agribusiness

The basis question is the best business organization system that a company can use to operate in many countries overseas, which will make a contribution to economic development of adequately complete and efficient agribusiness sectors of growing economies and yet provide an adequate return on investment.

Two basic systems for increasing farm production are (1) the conventional educational system, under which improved farm inputs are offered for sale to the farmer and programs are initiated to educate the farmers to use them properly with improved farming practices, and (2) the accelerated technical adoption system, under which some controlling entity such as an agribusiness consortium operates and manages the entire procurement, production, and marketing system of efficient-sized business units until local people are trained to take over. Attempts to increase farm production by conventional educational methods depend upon the separate decisions of each farmer and farm-related businessman. The efficient operation of both farms and related industry, however, depends on the coordination of production and marketing and the right combination of many variables such as purchased supplies, fixed resources, production decisions, market development, and many other inputs throughout the entire agribusiness production and marketing chain. If individuals do not put together a good combination of these necessities, no agribusiness development program can achieve acceptable efficiency.

With a consortium, on the other hand, a single operating entity can—from a single coordinated decision source—initiate all the steps necessary to create a modern agribusiness complex.

A consortium begins by evaluating the existing resource base, including labor, infrastructure, and land resources. It utilizes production technology available from all sources, worldwide, in order to achieve optimum results rapidly. But the program is even more complete. To succeed, it must and can also (1) provide needed control to coordinate the management systems for procurement, production, and marketing, and (2) determine the market demand and prices and match these with a supply of farm products which will maximize returns. This means operating on an adequate scale to achieve efficiency and economic impact on the growing economy.

Moreover, the consortium can be influential in encouraging private investment in related agribusiness ventures. It must pass on its technology to domestic labor and management, in order to train and prepare them to eventually realize complete domestic control. And finally, the consortium must arrange for the provision of adequate capital. Final decisions on involvement require a detailed feasibility study.

Such an agribusiness consortium system has been put together to implement an accelerated technological adoption system probably in the Dominican Republic first, although other countries are also under consideration. The consortium has been organized by five agribusiness companies: International Harvester, Dow, Worthington, Adela and IMC as a Delaware Corporation, and the Agro-Industrial Development Company (AGRIDCO), S.A.

After evaluation of several alternative business organization systems for economic development which effectively harness the combined resources of private enterprise and public development agencies, this system emerged as satisfying both the political and commercial realities.

The AGRIDCO economic development system is being applied first in the Dominican Republic because analysis revealed that the situation was favorable, the need was great, and it was conveniently nearby among developing nations for the initial project, which necessarily involves working out many details.

The Dominican Republic is approximately 18,700 square miles in area. Geographically, its location is excellent for serving the markets of the western hemisphere. The population currently numbers approximately four million people, with a labor force of about 1.3 million.

Unfortunately, unemployment in the Dominican Republic is around 35 percent. The nation's per capita income is $150—one of the lowest in Latin America. Although 3.1 million acres are presently being used for crops and pastures, another 6.0 million acres of potentially productive farm land are available. This fits in with the goal of AGRIDCO of developing new farmland and not displacing established farmers.

Initially, the government of the Dominican Republic made available to the consortium several tracts including over 400,000 acres for study and evaluation. Four of these tracts, totaling 87,500 acres, were found to be suitable for crop and pasture development by AGRIDCO. Since the initial study, AGRIDCO has requested and is now being granted more land of good agricultural potential in order to achieve a full impact on the Dominican economy.

In operation, AGRIDCO will rapidly and fully develop this acreage in order to bring it up to its optimum production capacity. The land will be cleared, drained, fertilized, planted, and irrigated. Overall, the farm business will be managed with modern, efficient mechanized agribusiness techniques.

While we are on the subject of land, let me state clearly that the consortium does not and will not own any of the land which it seeks to develop. Presently this acreage is owned by the government. As the program progresses, ownership of all production assets will be turned over to the Dominican farmers by the Dominican government and management responsibilities will be turned over by AGRIDCO to the management team of nationals that is developed. The basic terms of what is being called the "resource reform program" are included in the contract between the Dominican Republic government and AGRIDCO.

Land reform has been tried in the past in the Dominican Republic but failed because of a combination of circumstances. Parcels distributed to farmers were often small and of poor quality. Perhaps modern technology might have helped Dominican farmers to improve outputs on such land, but no such technology or financing was realistically available to them. Furthermore, the necessary infrastructure was lacking. In short, the farmers lacked what AGRIDCO intends to provide.

Currently, the Dominican economy suffers from an unfavorable balance of trade. World demand and price for several of its major usual tropical farm products for export have declined, while livestock and major food imports have been increasing. In the last two years, the balance of trade has been improving somewhat, but slowly.

There is a strong domestic and export demand for some farm products that can be produced in the Dominican Republic. The demand exists in the nearby island markets such as Puerto Rico, Jamaica, and Tobago. Demand, prices, and shipping have already been investigated by AGRIDCO, and it is anticipated that farm product marketing firms will be added to the consortium as they are needed.

What then will be the environment and the economic impact created by AGRIDCO? Significant economic and social benefits, including the resource reform program, are based on putting 200,000 acres of land into production within five to seven years. In so doing, the projections depend on an accelerated rate of AGRIDCO growth to full-scale agribusiness development, resulting in a significant impact on the Dominican Republic's economic and social climate for growth throughout many phases of the economy.

Estimates indicate that annual gross farm sales of AGRIDCO projects will total some $25 million for the four tracts of land already evaluated in detail (87,500 acres). This includes considerable irrigation and the production of cattle, grain crops, and a sizable acreage of multicropped vegetables.

In five years we estimate that AGRIDCO-related projects will directly employ at least 5,000 people and indirectly create a much larger number of new jobs.

AGRIDCO profits are strongly involved in social and investment benefits. About 50 percent of the profits will go to the government of the Dominican Republic. The government can use this money to develop needed infrastructure—medical services, government, municipal water, transportation, sanitation, communications, housing, power, schools, and recreation.

Of the remaining profit, 25 percent is committed in the contract for reinvestment in the Dominican Republic by AGRIDCO itself or the member companies, and the other 25 percent may be optionally reinvested. These reinvested earnings, plus new domestic and foreign capital investment stimulated by AGRIDCO, will be used to develop related business and industry, such as processing, storage, distribution, credit, industrial development, manufacturing, packing, and canning.

Another social benefit is that of land reform. We believe that this term reflects too narrow a basis for adequate agricultural development. "Resource reform" is a better way to describe the benefit, because it describes a total concept of the realignment of all resources associated with agribusiness to a more efficient system of production and social welfare. In other words, successful resource reform must include more than just land reform. It must involve broad social and economic progress.

If what I have just discussed appears to be a pretty tall challenge, let me hasten to add that AGRIDCO's success requires large amounts of innovative thinking and application. An innovative application of business organization systems and permanent farm financing methods will need to be devised under the resource reform program. The resource reform program is designed to provide an opportunity for Dominicans to own interests in the large farm business units and to receive compensation in proportion to their ownership, their labor, and their management contribution. The incentive compensation must be in accordance with the profitability of the agribusiness project with which they are involved.

Incentive compensation of these types must be provided for every person involved with the projects in order to provide the driving force of competition required for success and to teach the capitalistic system.

Innovative practices and education are also required to preserve the farms in efficient, commercial-sized business units after AGRIDCO relinquishes management control to local interests. Overall creative economic, social, and institutional research will be required to discover and build the best system of equity ownership and management control.

The broad potential impact of the consortium and its resource reform concepts have generated strong interest and favorable reactions from the Dominican Republic and other governments, AID, private agribusiness companies, the World Bank, the Heinz Committee and the Agribusiness Council, the foundations, area development banks, and the United Nations.

In my optimism, I do not wish to imply that we are resorting to Pollyanna thinking, for AGRIDCO has much to accomplish in the coming months and years. However, I hope you will agree that our goals are clear and that our enthusiasm is merited because these goals are obtainable.

We sincerely believe that AGRIDCO, as well as many similar consortiums yet to be developed, will prove to the world of today and tomorrow that men do not need to stand idle and frustrated as they face problems of economic and business development. Through cooperative efforts, including yours and mine, economic adjustment and technological adoption can lead to a better world for more people.

RURAL POVERTY

CHAIRMAN: JAMES BONNEN, MICHIGAN STATE UNIVERSITY

An Historical Review of the Nation's Efforts to Cope with Rural Poverty

JAMES G. MADDOX

THROUGHOUT the history of this country, one element in American ideology has been a belief in the concept of equality. The specific meaning of the concept has been variously defined. Some people have interpreted it in a spiritual sense as meaning that all men are equally the children of God. Others have viewed it as a juridical concept and have professed the belief that all men should be treated equally by law. Others have given it a growth connotation, commonly expressed in such terminology as "All men should have an equal opportunity to develop their inherent capabilities or potentials." Relatively few Americans have embraced the belief that all men should have equal incomes.

Regardless of how the concept is defined, it is perfectly clear that neither the founding fathers nor their successors have organized and operated a society in which all men have either equal power, equal status, or equal opportunities. Indeed, the whole history of American life has been filled with all sorts of discriminatory practices. The cynic, the skeptic, the purist can find evidence, today and yesterday, to argue that Americans have never really believed in the idea of equality among men, that both the literature and the liturgy which have long surrounded the concept of equality have been nothing more than a verbal facade behind which have hidden the most glaring inequalities and inequities. Moreoever, any honest reader of American history must admit that there is some truth in this view. But it is only a partial truth.

At the very same time that the American way of life in many of its social, economic, political, and religious dimensions has condoned and encouraged practices that have created and expanded areas of inequality, it has also spawned, nurtured, and encouraged other activities of an egalitarian nature. Relatively few Americans have been willing to convert Darwin's theory of evolution into an ethical guide to policy by saying that "only the strongest and fittest should survive." There have been repeated efforts —by government, by private enterprise, by religious agencies, and by philanthropists, large and small—to aid and assist the lowly and the poor and to throw up various types of barriers to the concentration of wealth and power in the hands of a few.

JAMES G. MADDOX *is professor of economics at North Carolina State University.*

Many of the important public actions aimed at coping with problems of rural poverty have been bunched together into fairly discrete periods, with substantial time spans between them, and typically they have been part of larger and more comprehensive reform movements. Four such periods of reform, each with important agricultural aspects, have occurred within approximately the past century. The first of these was during President Lincoln's administration and the years immediately following the Civil War. The second was during President Wilson's administration. A third great push toward the amelioration of rural poverty came soon after the inauguration of President Roosevelt in 1933 as a part of his New Deal policies. The beginnings of a fourth, and still continuing, attack on the rural poverty problem came with the Kennedy and Johnson administrations of the present decade.

The purposes of this paper are to describe briefly the principal actions to cope with the problems of rural poverty during the first three of these periods, to offer a few comments about the extent to which these actions affected the poverty problem, and to point to some of the shortcomings of past actions which may help to explain why rural poverty still remains, in the words of the recent President's National Advisory Commission on Rural Poverty, "a national disgrace."

The Civil War Period

There were numerous actions during and immediately following the Civil War which enhanced the political and economic status of poor farmers and farm workers. The most important of these was the emancipation of approximately four million Negro slaves and the destruction of the institution of slavery. In addition, the war dealt heavy blows to both the political and economic status of the rich and powerful class of southern planters. Morison and Commager contend that "the old planter aristocracy had suffered in the war more severely than any other group; for if the war had been 'a poor man's fight,' the poor white had nothing to lose, and his condition was no worse in 1870 than it had been in 1850. But the planters lost not only their youth but often their means of recuperation" [2, p. 7].

In addition to the abolition of slavery and a significant weakening of the political power and economic status of numerous southern planters, other important steps were taken during Lincoln's administration which tended toward improving conditions of life and the enlargement of opportunities for the rural poor. Among these were the passage of the Homestead Law, which provided free land to thousands of western farmers, and the Morrill Act, which made possible the development of the land-grant colleges with their emphasis on educating the sons and daughters of farmers and mechanics.

The abolition of slavery was surely the most important single step that the nation has ever taken toward eradicating rural poverty. Nevertheless, the emancipation of the slaves was not followed up by a well-designed, long-term program for significantly increasing their productivity. Most Negroes were left without the land, the capital, or the education that would have been necessary for them to have become productive and responsible citizens. Indeed, within a few years after the end of the Civil War, strong and definite steps were taken to keep the southern Negro in a subservient status. Consequently, his attempts to climb the economic ladder were generally thwarted and his incentives were seriously blunted.

> During the brief period of Radical Reconstruction [from approximately 1868 to 1877] the Negro did enjoy both civil and political rights. He was freed from the restrictions of the black codes; he exercised the vote; he held office. Nor did he suffer severe economic or social discrimination. Most of the jobs that he could do were freely open to him, and that large apparatus of social indignities that came later to be called "Jim Crow" had not yet been applied, or invented [2, p. 86].

Radical reconstruction—sometimes called Black Reconstruction—aroused extreme opposition in the South. Moreoever, it was expensive both to the federal government and to the depleted treasuries of the southern states. By the middle 1870's, "public opinion in the North was no longer willing to sustain federal intervention in the affairs of the South. Much of the idealism that had gone into the anti-slavery movement had petered out, or been deflected into new channels" [2, p. 47]. When Rutherford B. Hayes became president in 1877, following a series of political shenanigans which were hardly a model of democratic procedures,

> Congress, which had enacted three constitutional amendments and half a dozen Enforcement Acts all designed to protect the freedman, now threw in the sponge, and turned the "Negro problem" over to the South. That was what the South demanded as the price of reunion, and as the price would be paid by the Negro, the North did not find it exorbitant [2, pp. 86–87].

In addition to the abandonment of the idea and the ideal of Reconstruction by the Presidency and the Congress, the Supreme Court rendered a series of decisions, between 1873 and 1896, which virtually obliterated the original objectives of the Fourteenth and Fifteenth Amendments to the Constitution.

> What all this means—the end of Reconstruction, the restoration of white rule, the watering down of the Enforcement Acts and their judicial nullification—was that the Southern Negro was exiled to a kind of no-man's land halfway between slavery and freedom. He was no longer a slave; he was not yet free. He was tied to the soil by the sharecrop and crop-lien systems. He was excluded from most professions and from many jobs. He was fobbed off not only with segregated schools, but with many schools that were palpably inferior, and with "separate" accommodations that were rarely "equal" [2, p. 89].

If, following the Civil War, the nation had embarked on a long-term, comprehensive program for rehabilitating and restructuring the southern economy, to what extent would we now be faced with problems of rural and urban poverty? One can only speculate about the answer to this question. The hatreds and animosities generated by the war itself may have made any such program an impossibility. Clearly, however, we are presently reaping the harvest from seeds sown a century ago—seeds which stripped the Negro of opportunities for which he is now fighting. Moreover, many of the decisions of that period fastened on the South patterns of production, farm and nonfarm, which used as their major inputs an abundant supply of cheap, ignorant, docile laborers; a one-party political system, which often put the least progressive elements in society in positions of party leadership; and a set of attitudes and governmental institutions which placed an extremely low priority on education, research, and innovating entrepreneurship.

Although the nation fell far short of what it might have done to eliminate rural poverty during the Civil War period, there were substantial accomplishments. Slavery was abolished. Probably there was greater equality in the distribution of incomes and assets among farmers in 1880 than in 1860. Educational opportunities for both whites and blacks were expanded, though they were still meager or nonexistent for many rural children. And the foundations were laid for a great industrial and commercial expansion, which subsequently opened the doors of nonfarm opportunities to many farm boys and girls.

The Period of President Wilson's Administration

The first decade of the present century has sometimes been called "The Golden Age" of American agriculture. Both farm product prices and land values were rising. Agricultural output was expanding and efficiency in production was increasing. Nevertheless, the *Report of the Country Life Commission,* in January 1909, pointed to a long list of deficiencies in the rural countryside and suggested numerous steps that should be undertaken to improve country life [3].

Among the most important of the commission's recommendations were actions to redirect rural schools so that education would have a closer relation to rural living; expansion of cooperative efforts of many kinds, but particularly of cooperative organizations to aid farmers in buying and selling and in providing credit; encouragement of a system of extension work for rural communities to be carried out by the land-grant colleges; and a system of surveys of all agricultural regions to collect facts for "providing a basis on which to develop a scientifically and economically sound country life." There were many other recommendations of the commission, nearly all of which smacked heavily of a Jeffersonian type of agricultural fundamentalism, and which, at the same time, opted for an efficient, commerical agriculture and a type of country life which embodied many of the amenities of urban ways of living.

When Woodrow Wilson became president in 1912, his general program of economic reform contained several elements that were essentially the same as some of the recommendations of the Country Life Commission. It was in Wilson's administration that the Federal Land Bank system was established; that the Smith-Lever Act was passed, which established the Cooperative Agricultural Extension Service; and that the Smith–Hughes Act became law, which provided federal aid to schools to teach courses in vocational agriculture. In addition, there was legislation to strengthen the research and inspection work of the U. S. Department of Agriculture, to lower tariffs, to improve rural roads, and to restrain monopolistic practices in the nonfarm sectors of the economy. All of these actions were aimed at raising the incomes and enlarging the opportunities of farmers by increasing their efficiency and strengthening their bargaining power.

However, it is worth noting that neither the *Report of the Country Life Commission* nor the agricultural legislation of the Wilson administration was greatly concerned about the distribution of income, assets, or opportunities among different groups or classes of people within agriculture. The studies and congressional hearings which led to the establishment of the Federal Land Banks and the Joint Stock Land Banks expressed concern about the growth of farm tenancy, and the credit legislation was aimed in part at strengthening the family farm. The Agricultural Extension Service was, of course, expected to work with all farmers. Nevertheless, the most pervasive opinions about the agricultural situation of that period tended to ignore inequalities among farmers.

The result was legislation which provided a new group of public services which were ostensibly available to all farmers but which in actuality most readily served those farmers who were least in need of public assistance. In other words, those who already had good incomes, the highest net worths, the best education, and lived in the most prosperous communities were in the strongest positions to take advantage of the new public services. Moreover, the agencies which were created to administer the new programs were organized and operated in ways which encouraged the strong at the expense of the weak.

Many of the important impacts of the legislation passed during the Wilson administration were not felt in full force until the agricultural depression following World War I. However, they clearly lit the fuse for an explosive growth in the specialization, commercialization, and productivity of American agriculture. There can be little doubt that during the 1920's they were highly instrumental in bringing about both an increase in gross national product and a greater degree of inequality in incomes and assets among farmers. In many respects, they had opposite effects from those visualized by the men who served on the Country Life Commission in 1908. In part, this was because of a decline in the export demand for U.S. farm products following the war. Mainly, however, it was the result of increases in farm productivity stemming from the injections of new capital and new knowledge into farming.

With the exception of slow and meager improvements in Negro schools, very little was done in the Wilsonian period to improve the position of rural Negroes. It was in the decade of the 1920's that we witnessed the first really large-scale migration of Negroes out of the South into the urban centers of the Northeast and Midwest. They were being squeezed out of farming in the South at the same time that industrial job opportunities were opening up for them in the older manufacturing areas of the country.

The Period of the New Deal

The third great period of reform within the past century was launched as a part of President Roosevelt's New Deal program in the early 1930's. The New Deal embodied a broad and complicated series of governmental programs with two distinct types of objectives. One set of objectives was to restore economic prosperity, to bring the nation out of the worst depression it had ever experienced. The other set of objectives was to bring about long-term institutional reforms, many of which tended to strengthen the economic power and improve the incomes of the weaker and poorer classes in society.

Both types of objectives characterized the programs of the Resettlement Administration and its successor agency, the Farm Security Administration.[1] The former was the first major New Deal agency created explicitly to wage the administration's fight against rural poverty. It came into being by executive order on the last day of April 1935, as an independent agency. It was transferred to the U. S. Department of Agriculture at the end of December 1936, and its name was changed to the Farm Security Administration (FSA) in September 1937.

The immediate tasks of the Resettlement Administration were to attempt to counteract some of the effects which the acreage reduction and income-support activities of the Agricultural Adjustment Administration (AAA) were having in the South, and to cope with the needs of drought-stricken farmers in the Great Plains and parts of the Midwest. The acreage reduction programs of the AAA were encouraging landlords to reduce the number of tenants, sharecroppers, and farm laborers on their farms and to prevent many of those who remained from sharing equitably in government payments. This situation, together with the high levels of unemployment throughout the economy, resulted in thousands of the lowest-income people in farming being deprived of a share in the rather substantial flow of government payments that were going to farmers, and, in some cases, of an opportunity either to stay on the land and eke out a subsistence level of living or to find a nonfarm job. In the Great Plains and parts of the Midwest, serious drought conditions and low farm product prices were forcing farmers onto public relief rolls. To meet these emergency situations, the Resettlement Administration relied heavily on making subsistence grants and short-term feed, seed, and food loans to farm families in dire need.

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[1] For an excellent history of these agencies see Baldwin [1].

Thus, one important function of the Resettlement Administration was to cope with crisis situations. It had, however, long-term objectives. Among the most important of these, as visualized by Rexford G. Tugwell, its first Administrator, were the retirement of large areas of submarginal land from farming and the resettlement of its occupants in new, planned communities on fertile soil; the building of greenbelt towns for low-income urban families around a few large cities; a reduction in farm tenancy by making loans to tenants to become farm owners; and the construction and operation of camp facilities for use of migratory farm laborers.

Programs embodying all of these objectives and a few others, such as the management of several subsistence homestead projects that were transferred from the Department of Interior and the administration of a debt adjustment service which had formerly been in the Farm Credit Administration, were fitted into a nationwide organization, with regional, state, district, and county offices, during the first year of life of the Resettlement Administration. Although the resettlement and subsistence homestead projects, greenbelt towns, and migratory labor camps received much early publicity and created a long-lingering public image of both the Resettlement Administration and the FSA, in actual operating practice both agencies allocated their major efforts toward improving the productivity and levels of living of poor farm families in the immediate areas, often on the same farms, where they had been living for years.

> By the late summer of 1935, the leaders of the Resettlement Administration discovered that administrative resistances, legal and financial limitations, differences and conflicts among the diverse personnel of the agency, and shifts in the political environment compelled them to re-examine their original intention of giving primary emphasis to land reform and resettlement. Large-scale land acquisition and retirement, for instance, proved to be an exceedingly difficult, costly, and time-consuming process, and the leaders of the program struggled in vain to assemble even enough productive land for the resettlement of dislocated families [1, p. 106].

Well before the Resettlement Administration was transferred to the Department of Agriculture, at which time Tugwell resigned both as Administrator of the Resettlement Administration and as Under Secretary of Agriculture and temporarily retired from government service, the operating emphasis of the agency had shifted from land reform and resettlement to "rehabilitation in place." By the time of the change of name to the Farm Security Administration in the fall of 1937, much of the early Tugwellian idealism, which had been aimed at eliminating rural poverty by restructuring major aspects of American agriculture, had been dashed asunder by hard economic, political, and bureaucratic realities, and the agency was well on its way along a more prosaic course.

There were four principal operating programs by which the FSA attempted to improve the status of the "underdog" in agriculture: (1) rural rehabilitation, (2) farm ownership, (3) resettlement projects, and (4) labor camps and medical care for migrant farm workers.

Of these, rural rehabilitation was by far the largest and most important in terms of funds used and families affected. The principal rehabilitation tools were (*a*) loans for farm operations, family living, and capital goods, each of which was based on an individual farm and home plan and followed up by supervisory assistance to the borrowing family; (*b*) a tenure improvement program aimed at increasing the equitableness and security of farm leases; (*c*) special water-facilities loans and grants to improve the water supplies of dryland farmers in the West; (*d*) a special program of promoting and financing cooperatives and group services among low-income farmers; and (*e*) a rural medical care and sanitation program.

The farm ownership program was the second largest of the FSA activities. It was aimed primarily at aiding selected tenant and sharecropper families in becoming the owners of family-sized farms. It tackled this objective by making 40-year, 3-percent-interest loans to qualified tenants and giving them detailed assistance in farm and home planning, as well as supervisory advice on ways and means of improving their farm and home management practices.

The resettlement project program of FSA, the third largest activity, stemmed from several sources with varying objectives, but it was primarily concerned with the development, management, and ultimate liquidation of a group of new communities, which were established for the purpose of creating a better environment for families which were either unemployed in the cities or were occupying farms that were too small and infertile for farming. Such families were moved to the new communities, or onto special project farms scattered among existing communities, and given an opportunity to become the owners of these farms after a trial leasing period.

The FSA's labor program was aimed primarily at providing camps and temporary shelters for migrant farm workers in order to improve the housing conditions of a group with notoriously low levels of living. It also made available low-cost medical care through special health associations. During the war years, the labor program was turned into a special recruitment, transportation, and housing activity for the purpose of obtaining farm workers from neighboring countries and shifting the domestic supply of agricultural laborers from areas of surplus to areas of shortage.

In carrying out these programs, the FSA and the Resettlement Administration which preceded it obligated almost $2 billion from 1935 to 1946. In connection with the first three programs, over one million farm families were given some sort of assistance during this period. Almost 900,000 families received rehabilitation or farm ownership loans. Another seven to eight thousand became the owners of farms or subsistence homesteads in connection with the resettlement project activities. It is not known how many families were housed at one time or another in the FSA labor camps or availed themselves of low-cost medical care provided by this program. The number, however, may have been quite large. But this program did not cope with the basic problems of migrant farm workers in the fundamental manner that characterized the rural rehabilitation, farm ownership, and resettlement project activities.

Most of the families aided by the rural rehabilitation and farm ownership programs made substantial progress in raising their levels of living and accumulating capital. Although the rising price level and expanding nonfarm employment opportunities incident to World War II were a great boon to the progress of the families, there are valid grounds for concluding that the FSA-type program was a sound but inadequate approach to ameliorating poverty. Nevertheless, the FSA ran into serious difficulties in Congress soon after the outbreak of the war.

Within the agricultural establishment, the FSA had represented the "social conscience of the New Deal." The advent of the war brought the abandonment of many New Deal programs. Although the FSA made serious efforts to adjust to the exigencies of the wartime situation, it had powerful ideological enemies in Congress, in some parts of the agricultural bureaucracy, and in one or two potent pressure groups outside of government. It was badly crippled by appropriation cuts after 1942, harassed by congressional investigations, and finally abolished in 1946. It was succeeded by the Farmers Home Administration, which with the coming of the Kennedy and Johnson administrations has taken on new life and is again engaged in a war on rural poverty.

Shortcomings of Past Actions

According to present-day values and definitions, the government policies and programs of the past failed to eliminate rural poverty. The gross national product, and hence the average level of living, has risen significantly in the past century. But great inequalities in the personal distribution of the national output still remain. Not only is the average level of farmer income low relative to that of other occupational groups, but also there is a higher proportion of poverty-stricken people in farming than in other major industries. Wherein have past efforts to abolish rural poverty failed? What lessons can be learned from these past actions that may be of value in guiding future policies? Only a few major points can be mentioned in this paper.

First, and of particular importance during the past 30 to 40 years, has been the rapid rise in productivity per man-hour of labor in agriculture (resulting from the substitution of capital and new technology for labor) and the slowly expanding and inelastic demand for farm products. The combination of these two forces in our highly competitive farming industry has made necessary an extremely rapid shift of manpower out of farming, if returns to labor services in agriculture were not to decline relative to those in other types of employment. Many farm people have been unable or unwilling to make the necessary adjustments at a speed sufficiently rapid to eliminate rural poverty. Moreover, these same two forces, combined with prevailing methods of supplying capital to farmers, have made it more difficult for the farmer with meager assets and poor managerial ability to obtain the necessary capital and knowledge than for the man with large assets and good managerial ability.

Second, the inability or unwillingness of farm people to shift out of farming has been hampered by two serious shortcomings in nonfarm policies. One of these has been monetary and fiscal policies which permitted recurring, and sometimes sustained, periods of high rates of unemployment in the nonfarm sector of the economy. The other has been inadequate financing and lack of imagination in designing and operating a system of public education fitted to the needs of rural people.

Third, the great majority of farm programs—research, extension, credit, acreage reduction, price and income supports—have worked to the disadvantage of small, low-output farmers and farm laborers. In some cases, the impacts have been direct and forthright, as with acreage reductions resulting in tenants, sharecroppers, and laborers, who were poorly prepared for other jobs, being pushed out of farming. In most cases, the impacts of these programs have worked indirectly to increase the incomes, assets, and bargaining power of the large and efficient operators at the expense of the small and inefficient producers. Some of the farm programs, such as those administered by the Resettlement Administration, the FSA, the Farmers Home Administration, and perhaps a few others, have been aimed directly at assisting the rural poor, but they have been small and puny efforts compared to those that have redounded to the benefit of farmers with relatively high incomes and substantial assets.

Fourth, long-standing attitudes of whites toward blacks—attitudes often expressed in legislation and administration of public policies, as well as in countless private relationships—have tended to keep Negroes, especially those living in rural areas, at the bottom of the economic ladder. The general patterns of behavior of whites not only have placed real barriers to the upward progress of most Negroes but also have tended to stifle the Negro's incentives and ambition.

These are only some of the most important shortcomings of past efforts to ameliorate rural poverty. To put the matter bluntly, the rural poor have lived and worked in a total environment of technological change, public policies, and distorted racial attitudes that has kept them in a disadvantaged position relative to the more well-to-do members of society. Until this total environment is substantially altered, we will continue to have rural poverty commissions to make recommendations about it and meetings of economists to discuss it.

The major directions of change that are needed are obvious. They include sustained full employment, very substantial improvements in both the quantity and quality of rural education, a revamping of farm policies which will distribute benefits more widely throughout the farm population, and a removal of barriers to the economic progress of Negroes. To aid in moving in these directions, economists, in choosing their research and extension projects, might seriously consider the impacts which they can have on reducing the total social costs of rural poverty versus the total social benefits which they generate by assisting relatively high-income farmers to increase their productive efficiency.

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[3] U.S. Senate, *Report of the Country Life Commission,* Senate Doc. 705, 60th Cong., 2d Sess. 1909.

An Economic Critique of the National Advisory Commission Report on Rural Poverty

W. W. McPherson[*]

THE National Advisory Commission on Rural Poverty, appointed by President Johnson in September 1966, has issued two reports, namely, *The People Left Behind* [12] and *Rural Poverty in the United States* [13]. The latter report, as well as numerous other papers prepared for the commission [13, p. 601], provided background information for the commission in arriving at the recommendations submitted to the President in its report entitled *The People Left Behind.* My critique is based almost entirely on the first of these documents.

Despite the dangers confronted in any attempt to summarize such an extensive report, which in itself is a summary, I feel that there is a need to provide a brief summary before commenting on the report.

A Very Brief Summary of the Report

The commission was charged with the responsibilities of making a comprehensive study and appraisal of the current economic situations and trends in American rural life; evaluating existing programs, policies, and activities relating to the economic status and community welfare of rural people; and developing recommendations for action by local, state or federal governments or private enterprise in order to provide opportunities for the rural population to share in America's abundance [12, p. vi].

Although the commission was charged with matters of poverty pertaining to the rural areas, it recognized clearly the interdependency between problems of rural and urban areas: many of the poverty cases in cities today are poor migrants from the rural areas. Also, the commission recognized that solutions to problems of rural people could not always be found within rural boundaries.

The basic ideas underlying the report and subscribed to by all members of the commission are given in nine statements of belief [12, p. xiii]. On the basis of these and other statements, my summary interpretation of the underlying philosophy on which the commission based its report is as follows:

1. We have the technical capability to raise substantially the economic and social status of the 33.7 million people (17.7 percent of the total) in the United States, including 13.8 million rural people (25.0 percent of all

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[*] I am grateful to Leo Polopolus and Lester H. Myers, who were kind enough to read an earlier draft of this paper and to furnish suggestions for revision.

W. W. McPherson *is graduate research professor at the University of Florida.*

rural persons) who have been classified as poor on the basis of 1964 income data.

2. We have lacked the will to do so.

3. The poverty conditions found among individuals and families are due mainly to conditions over which they have no direct control.

4. The individual has a right to enjoy certain minimum standards, not as a matter of charity, but as a matter of justice.

5. The major problem is a lack of opportunity for the individual, which in turn is due to imperfections in our economic, social, and political systems.

6. The solutions are to be found largely in direct public action to remove these imperfections.

Six reasons were given as the basis for special and immediate action with respect to rural areas:

1. It is demanded by simple justice, in view of the greater incidence in the rural areas of persons who are refugees from technological change and the greater incidence of discrimination in rural areas.

2. The desire of the rural poor to have the same goods and services enjoyed by most urban people has led to an excessive piling up of rural refugees in our central cities.

3. Antipoverty programs of the past have tended to bypass the rural poor.

4. Rural communities do not share the benefits of much of our nation's economic growth and technical change.

5. Our rural communities are unable to prepare people for full participation in our modern and rapidly changing society.

6. Our public programs in rural America are woefully out of date.

Poverty was defined as lack of access to respected positions and lack of power to do anything about it, insecurity and unstable homes, and a wretched existence that tends to perpetuate itself from one generation to the next, as well as an income level below that needed to provide the kind of living that our society considers a basic human right. The minimum income level changes with conditions, but an average figure of $3,000 per family was used as a rough approximation [12, p. 7]. In connection with specific programs, net-worth and cost-of-living differences were brought into the specifications.

Specific rural problems—unemployment, health, education, housing, deteriorating communities, and existing government programs—were examined, and both new programs and changes in current ones were recommended.

Emphasis was given to changing the conditions believed to give rise to poverty—preventive measures that would increase opportunities. The commission very correctly recognized the fact that many factors affecting the opportunities and welfare of any individual are matters over which the individual, acting alone, has no control. These are matters of public responsibility. Included among the recommendations were insuring full employment (including a proposal that the government stand ready to provide jobs at national minimum wage rates or better to every person willing and able to work), upgrading and extending education at all levels, modernizing government and development planning, extending the wages-and-hours provision of the Fair Labor Standards Act to all occupations, giving additional assistance in family planning, and unifying on a national basis and upgrading the Federal-State Employment Service.

A second category of recommendations concerned the matter of increasing the ability of individuals to take advantage of opportunities that exist or that are likely to arise. Among these recommendations are the reduction in all sources of discrimination, job training and retraining, assistance in mobility, and reduction in the penalty placed on earnings of persons participating in welfare programs.

A third set of recommendations was concerned with those persons who are unable to respond to economic opportunities because of health, age, family responsibilities, or other conditions. For this group, major recommendations include increases in direct income transfer, with emphasis on cash rather than materials, and expansion and modifications of programs in kind for health, food, clothing, housing, and education.

Many of these programs, such as manpower and employment, social security, health, and education, extend to the economy in general—well beyond the rural poverty group. However, I have no quarrel with the commission's approach. Certainly, problems of those persons in the rural poverty category cannot be solved in isolation from the remainder of the economy. In general, it was recommended that federal, state, and local programs, such as those in labor and education, be applied to rural areas in terms equal to those of urban areas. This has not been done in the past.

Comments

The underlying philosophy

For many hundreds of years the burden of adjusting to changes was left almost entirely to the individual and family, and what one received over the value of his marginal productivity was purely a matter of charity. Watkins expressed the problem as follows: "Preoccupied with the advantages of technological progress, enlightened economists were willing to allow the discoverer of new methods of production to deprive less efficient producers of their traditional livelihood, immediately and without compensation, through the operation of free competitive markets. For intelligent and adaptable members of the middle class, the costs of change were not excessive in comparison with the profits. For those who had to bear the brunt of innovation, the situation was disastrous. Absolute adaptability to the requirements of a constantly changing society is an impossible standard of behavior for ordinary man" [15, p. 181]. At one point J. S. Mill argued that technological change would remove poverty, and consequently crime, wars, and other evils would disappear [9, pp. 272–275].

Arguments that providing the means of earning a minimum level of living and social status, together with insuring equal opportunities, is a direct responsibility of government are provided toward the end of the nineteenth century by Green and Hobhouse [3; 14, pp. 673–679]. The ideas underlying the report are not new, and for a number of years we have been moving from the early extreme of placing the full burden of low incomes and adjustment to change on the individual and family, to the other extreme of making them essentially a total responsibility of government. But we do not as yet have a set of homogeneous values with respect to individual and government relationships. It is surprising that even so small a group as the commission could reach agreement on such a wide range of problems and recommendations with so few reservations.

Identifying and measuring poverty

The commission initially identified poverty in terms of minimum family income and associated features such as lack of access to respected positions, insecurity, and wretched existence. For determining eligibility for financial aid and social service, it recommended a nationwide needs standard, with due consideration for differences in cost of living by family size, region, and city size, in relation to family income and net worth. Considerable effort has gone into a search for a unique definition of poverty. Emphasis upon a unique "poverty" class may play a useful dramatizing role in calling our attention to the magnitude of the problem symptoms. But I believe we are attempting to establish a dichotomy when in fact we are dealing with characteristics of a continuous nature. Thus, in studying the report I was somewhat confused by the emphasis on a dichotomy of people in poverty and people not in poverty, while the recommendations appear to reflect a variable definition of poverty.

Before leaving this matter, there is one item of detail on which I would like to comment. Should subsistence items, especially food, produced by the family be included in income for the purpose of determining eligibility for financial aid and special services? I am inclined, for two reasons, to answer "no" to this question. First, production for home consumption is expected to continue downward and to become a smaller and smaller share of total income. Second, it is quite possible that a large number of those rural families who do not produce part of their own food supply could do so. Thus, I see no reason for penalizing those who do work to contribute to their subsistence.

Full employment is not enough

It was the consensus of the commission that full-employment policies, both to maintain growth in aggregate demand and to facilitate structural shifts, are necessary but not sufficient to achieve and maintain the desired minimum income and consumption standards. There is substantial empirical evidence to support this position [1; 5; 6, pp. 206–207; 7; 8]. The most rapid rates of decline in numbers of families in the lowest income bracket, and the highest relative gains in median per capita incomes in those states below the average, occur during periods of most rapid growth in aggregate employment. But for various reasons a significantly large number of our families and individuals have failed to rise from substandard economic and social levels.

Some major economic considerations

I have found it impossible to produce an extensive and rigorous economic evaluation of the commission's recommendations. Given time to study the staff papers on which the recommendations were based, I am sure that a more adequate critique could be produced. The report does not give an estimate of the required financial support nor its structure. The assumptions on which some of the conclusions are based (effects of extension of minimum wages, for example) are neither made explicit nor verified empirically. The absence of this information is not presented as a criticism of the commission's work. To require this information would have been asking too much from the commission and its staff in the very limited time allotted. But the absence of this information does limit the extent to which any analysis can be made at this time.

Despite the absence of the information outlined above, I believe that some relevant judgments can be offered. Many parts of the recommended program would "pay off" in purely economic terms, as I shall indicate later. Other parts are justified on the basis of economic and social justice. It is believed that our democratic institutions, if they are to stand on a broad political base, must be responsive to the troubles and demands of all individuals and groups, including those affected adversely by progress and those who for various reasons are unable or reluctant to respond to opportunities before them.

Extension of unemployment and retirement benefits are essentially compulsory insurance and would become self-supporting. Empirical evidence that is being accumulated appears to show that the gains from the job-oriented training and retraining programs are well in excess of the costs [12, pp. 32–33]. However, this does not mean that they could not be made more effective.

In recent years an impressive amount of empirical evidence on the economic value of education has been accumulated [2, 4, 10]. Undoubtedly, the educational measures, over the course of time, would pay for themselves in economic terms alone. But much of the gain from current payouts would be reflected in the income stream of the more distant future and would not automatically fall directly within the sources of public revenues. There is evidence that the gains for education would be increased if appropriate changes could be made in other interacting conditions such as job discrimination. An indication of this interdependency is demonstrated by a recent study made by Lassiter [4, p. 20]. The projected income potential of the southern nonwhite male with 16 years of schooling ($157,000) was less than the projected income of the nonsouthern nonwhite male with 8 years of schooling ($172,000). These results are consistent with observations of high dropout rates and migration among the southern nonwhites. Even so, the internal (personal) marginal rate of returns for the nonwhite male of the South at the sixteenth year of schooling was 6 percent [4, p. 21]. Moreover, there is reason to believe that there are valuable consumption elements in education that do not appear in the income differentials, and it is quite likely that education contributes substantially to the reduction in discrimination barriers.

Another matter of major economic importance is the commission's recommendation of a universal minimum wage accompanied by a federal program of guaranteed employment. The report indicates that implementation of the universal minimum wage would mean higher cash costs to farmers operating with hired labor, reduction in output and increases in prices of farm commodities (thus higher incomes to family labor), and substitution of machines for labor (thus a reduction in employment on farms). But there would be an increase in employment in the industries that manufacture, sell, and service the new machines. In the long run, increased labor productivity with the use of new capital might more than offset the higher wage rates, and unit costs of farm output would fall. The general impression gathered from the report is that the net effect of universal minimum wages on employment in the private sector would be rather negligible, given sufficient time for the adjustments to be worked out.

I have no objection to the direction of changes indicated. To be more specific would require that we turn to empirical analysis of the labor market, the demand for products, and the technical rates of substitution between labor and other factors. And, since the nature of the guaranteed employment program is not specified, we cannot estimate the relative benefits and costs of this proposal.

If one of the objectives is to extend greater bargaining power to unorganized workers, I doubt that a group so heterogeneous as this can be effectively united by means other than a federal program of the type recommended.

Another item of popular concern is inflation. If the commission's recommendations were to be fully implemented, what would be the magnitude and income distribution effects of inflation? The direction of the effects on inflation probably would be upward. There would be increasing pressures on the lags in structural change. Implementation would require occupational shifts in labor already employed, as well as employment of existing unemployed and underemployed labor. The income transfer would move income from persons with a low propensity to consume to those with a higher one. Much of the increased output from expenditures on education, housing, and other services would arise at some future date rather than in the current period of expenditure. Also, the net results would depend on the types and quantities of goods and services produced by the additional employment, and on the manner in which the program would be financed. A number of "if this, then that" statements could be made, but I do not believe it worthwhile to do so until we have developed more concrete proposals for the guaranteed employment program and the whole financial support program.

National unification and standardization

I heartily support the recommendations for unifying and standardizing essentially all programs on a national basis subject to modifications in accordance with relevant differences among areas. This action will raise tremendous problems of financial and control structures, as related to local–state–federal relationships. But these problems must be solved. This point leads into our next topic.

Organizational structure and capabilities

General acceptance and implementation of the commission's recommendations will require that much additional work be done with respect to development of the financial support program, including its responsibility and control structure among local–state–federal sources, and among different agencies at each level of government. Many of the problems arise from conflicts of interests among groups. In a very large number of instances the local area and even the state will not have a base large enough to reconcile these conflicts in a satisfactory manner. For this reason and others, I believe that national unification, and additional responsibility and control of most of the programs at the federal level, as recommended by the commission, are justified. On the other hand, increased financial support and coordinated efforts at all levels will be required if the recommendations of the commission are to be implemented successfully. State and local governments must become more development and growth oriented. The district and regional offices for development planning which were recommended could provide a useful staff service to state and local governments. Measuring and reporting progress and discovering "bottlenecks" in implementation should be among their functions.

As a final comment on the matter of organization, I believe that the recommendations of the commission take us a long way in the right direction. But I believe that there would remain excessive fragmentation and unclear lines and ties of responsibilities and authority. Further consolidation of the offices of public agencies would, I am sure, be welcomed by all concerned. Conveniently located information offices, which could answer questions regardless of agency or level of government, would also help to reduce the frustrations of the individuals concerned.

Payments in cash versus payments in kind

On the basis of neoclassical economics, payments in cash should produce utility levels equal to or greater than payments of equal monetary value when made in kind. The commission placed greater emphasis on cash payments than has been the case in the past. However, it recommends benefits in kind for food, clothing, health, housing, and education programs. Personally, I support their recommendation. In the case of these basic goods and services, I believe that payments in kind are necessary to insure minimum levels of subsistence for all household members, especially the children. Phasing out the direct food distribution program and expanding and modifying the stamp program, including its extension to cover the school lunch and breakfast programs, as recommended, would accomplish major improvements over present programs. Also, in the area of income expenditure and consumption, more extensive and intensive extension work to advise low-income families with respect to choice among possibilities would result in utility increases in many cases.

Those who are able but not willing

The commission's program deals extensively with those persons who are able and willing to respond to opportunity and those who, because of age, mental or physical handicap, and other conditions, are unable to respond to opportunities. It presents no recommendations other than counseling for those who apparently are able but unwilling to respond to opportunities. The report does state, however, that "there is such a thing as a culture of poverty" [12, p. 8]. I believe that this statement is a recognition of the fact that there are those who fail to respond to opportunities such as education and employment. Yet the general impression given by the report is that essentially every able person is anxious to work and to obtain all possible education. Elsewhere it was reported that, in one case, "a retraining program under ARA at Huntington, West Virginia, interested only 640 of an estimated 7,000 to 8,000 unemployed, even though $23 per week subsistence pay was offered. Only 200 of these completed the forms and are now certified for the training. Unemployed prospects contacted about the training program generally gave one of the following three answers: (1) I'm just not interested; (2) I expect to be called back to work soon; (3) I'm too old to be starting all over again" [11, p. 7]. How widespread are cases of this type? To my knowledge, we have no indication of the number of persons involved. If it is an important number, then we should have further work to develop corrective measures. Although increased counseling is recommended, I doubt that the recommendations place sufficient emphasis on motivation and other social and psychological matters as related to poverty. I believe that these matters should have received more attention despite the fact that the charge to the commission emphasized the economics of poverty.

Reduction of penalty on earnings of public assistance recipients

The recommendation that the heavy penalties on earnings of public assistance recipients be reduced is overdue. I expect that the present restrictions were developed when the number of jobs was viewed as fixed, and it was thought that employment of these persons would merely take away jobs from others. Especially with an effective full-employment program, this condition does not hold true, and penalties of this sort conflict with the objective of raising extremely low incomes.

Balancing demand and supply

With respect to public services, I believe there is some danger that recommended programs would increase quantities demanded much more rapidly than quantities supplied, particularly in education and health. In food, with our "excess" capacity to produce, there probably would be no serious difficulty in meeting the increased demands of the recommended stamp and school programs. But in the areas of education and health a much more concrete program is needed to supply the required personnel and facilities.

Seasonal demand for farm labor

The highly seasonal nature of the demand for farm labor probably is the most important factor related to low labor earnings in farming. This matter certainly is not limited to migratory workers. More work is needed on, among other things, the evaluation of employment possibilities, in or near farming areas, during the periods of low demand for labor on farms. Rather soon we may expect to depend on imports or forego the consumption of some farm commodities unless there are breakthroughs in the mechanization of practices in the peak labor periods. However, it is likely that vested producer interests will continue to press hard for foreign labor to meet seasonal peaks in demand.

Research on location of economic activity

To implement properly and, in some cases, develop further the commission's recommended program, it is urgent that we direct substantially more resources into forward-looking research in the matter of location of population and economic activity. Much of what we are spending on other research probably would bring a higher payoff if it were diverted to some of the questions most relevant for guiding future location of population and economic activity, both private and public.

Concluding Remarks

The commission and its staff are to be highly commended for the tremendous volume of materials prepared and the comprehensive set of recommendations developed in such a short period. The modifications, standardizations, and unifications of our manpower and welfare programs as recommended by the commission would certainly increase their effectiveness as well as the equity of their results. But much hard work remains to be done before we can provide a rigorous economic analysis of the recommendations. A specific program must be developed to implement guaranteed employment. The magnitude and structure of the necessary financial support must be determined. And there is still much to be done on organizational structure, including the general matter of local–state–federal and interagency relationships.

I fear that full implementation of the recommendations would increase the demand for some of our services, such as education and health, faster than supply would be increased. There is much more work to be done to develop the specific content of these programs.

There are many implications for research, but I believe that the most important one is a critical need for some forward-looking work on the location of population and economic activity.

The commission has made extensive recommendations to increase economic opportunities, to improve individuals' capacities to take advantage of opportunities, and to provide minimum levels of services and incomes for those persons who are willing but unable to earn the recommended minimum levels of services and incomes through employment. Little is said about those persons who are able but unwilling to take advantage of their opportunities. How important is this problem? If it is important, what more can be done about motivation and other social and psychological factors as related to poverty? I do not know the answer to these questions, but I do believe that they merit further attention.

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Providing Direct Income and Employment Assistance to Existing Poor People

W. B. BACK

THE President's National Advisory Commission on Rural Poverty made two general types of recommendations: (1) those intended to alter the conditions creating and perpetuating poverty, and (2) those to provide direct income, employment, and other assistance to existing poor people. I shall address my remarks to those recommended policies and programs providing direct income and employment assistance to existing poor people. More specifically, I shall try to express the philosophy and reasoning of the commission underlying their recommendations for increasing employment of the existing poor, in both public and private sectors, and for transferring income, or income in kind, to those not expected to participate in the labor force sufficiently to attain socially acceptable levels of living.

A basic belief of the commission was that people attach self-respect, dignity, and pride to gaining a livelihood through productive and meaningful employment. Because of this belief, the commission stressed policies and programs with promise of reducing poverty through increased employment of the existing poor in private sectors and, as a last resort, in the public sector. To maximize employment of the poor in private sectors, the commission's recommendations stressed (1) greater attention to effects of national monetary and fiscal policies upon the rate of unemployment—nationally, regionally, and by sectors, (2) a more effective national manpower policy, including an expansion and coordination of manpower training, mobility assistance, and job placement services, and (3) elimination of such institutional barriers to individual employment opportunities as racial discrimination.

Existing legislation on minimum wages assures socially acceptable levels of income to those fully employed persons in most sectors of the economy. The major exceptions are agriculture and related rural occupations. The policy of instituting minimum wages in some sectors, while exempting others, results in accumulation of the least productive workers in the exempted industries. The commission recognized that an extension of national minimum wages to all industries may have initial effects of reducing employment in many rural areas and/or increasing prices of many products. However, because the commission believed that every person willing and able to work has a right to a job at wages consistent with a

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W. B. BACK *is an agricultural economist with the Economic Research Service, USDA.*

socially acceptable level of living, it recommended both (1) an extension of national minimum wages to all occupations and (2) public service employment at these wage levels or higher for all workers unable to gain employment in the private sectors. If the latter recommendation were fully and effectively implemented, the private sectors likely would have to pay minimum wages or higher in order to attract workers. In this event, the recommended minimum wages for all private sectors would become redundant. The commission's intent was to implement fully the Employment Act of 1946, with the added proviso of wages sufficient to assure adequate incomes of full-time workers and their families, not just to assure minimum wages per se.

Obviously, the commission rejected the ethical implications of the economic principle of marginal productivity as a basis for wage rates and income of workers with the lower skill levels. By doing so, it accepted the principle of public contribution to income of those whose productivity as workers is below that consistent with a minimum socially acceptable level of income. The commission's recommendations attach to public service employment any direct subsidization of wages or income of workers necessary for achievement of the minimum levels. However, the intent was to minimize this subsidization in three major ways: (1) by maximizing the public value per dollar outlay for work done under public service employment, (2) by providing manpower training and related services to those in public service employment who could be expected to respond favorably and possibly transfer eventually to private sector employment, and (3) by providing greatly expanded manpower training, mobility assistance, and job placement services to all workers in need of these services for getting out, or staying out, of poverty.

There exists, and will continue to exist, a large group of people who are either unemployable, even in public service employment, or are employable only on a part-time basis. Examples are the aged, those partially or totally disabled, and mothers of dependent children. Direct transfers of income (or income in kind) to these people are necessary. The commission's view was that, except for OASDI, these direct transfers should be fully financed by the federal government, through transfers to states, on the basis of a nationwide needs standard. The commission recommends that OASDI be converted to a self-financing, compulsory insurance program. In addition to recommending the "nationalizing" of public assistance programs, the most significant recommendations regarding direct income transfer programs related to removal of the high penalty for working by those able and willing to work part time. This applies to those receiving benefits from both OASDI and such public assistance programs as old age assistance, aid to dependent children, or aid to the physically handicapped. For the public assistance programs, the commission recommended that, instead of the current practice of reducing welfare payments by a dollar for each dollar earned in work, the recipients of these transfers be allowed to retain at least 50 percent of their earnings from work, without a reduction in their welfare payments, until total income reaches some designated level well above the amount of the direct transfers. The procedure for doing this could be in accordance with the principle underlying the negative income tax proposals. The basic intent was to encourage those recipients of direct income transfers to work in accordance with their capabilities, instead of the current policy of eliminating all incentive to work. Also, the recommendations were intended to provide means for persons to be automatically phased out of dependence upon welfare as their incomes from work improve.

The commission made a number of recommendations to assist those in immediate need of food, clothing, housing, and health services. It was recognized that many of these recommendations will become redundant as other policies and programs become successful in alleviating poverty.

The commission did not favor such income maintenance schemes as a designated individual or family allowance proposed by Robert Theobald, or a negative income tax as proposed by Milton Friedman and others. Why? The approach taken by the commission implies three major concerns about these proposals as exclusive methods of reducing or eliminating poverty: (1) they offer little, if any, hope of altering the conditions creating and perpetuating poverty; (2) they fail to provide positive assistance to the poor in developing skills and in acquiring productive employment; and (3) they would not necessarily result in alleviating the immediate needs of poor people for food, clothing, housing, and health services. The commission believed a concerted attack should be made upon basic causes of poverty while, and in conjunction with, making any needed transfers of income and income in kind to the poor. The long-run objective of the commission was to reduce poverty, or the need for public transfers of income and income in kind, to an irreducible minimum.

Area and Regional Development Facets of *The People Left Behind*

W. Keith Bryant

IN the latter third of *The People Left Behind* [President's National Advisory Commission on Rural Poverty, Washington, Government Printing Office, 1967] the commission turned away from the specific job, health, housing, and educational needs of the poor rural individual. It focused instead on the individual's economic, social, and governmental environment and upon the problems of financing, assembling, and coordinating the various programs discussed earlier. In doing so, the commission was confronted with the problems of area and regional development, community organization, and intergovernmental relations. I shall restrict my comments to these aspects of the commission's discussions and recommendations.

The commission viewed a welter of interdependent problems arising out of the pervasive economic growth and technical change undergone by our society. Among these are included the location characteristics of the industrial and service sectors, plus the declining manpower needs of agriculture, forestry, fisheries, and mining which have drastically reduced the employment opportunities in the nonurban and outlying areas of the country. High rural birth rates exacerbate the situation. The developing transportation and communications systems have confronted small towns and villages with severe competition from large towns and cities, as well as knitting rural and urban parts closely together economically and socially.

Specialization of function has occurred and scale economies are present in the public as well as the private sector, increasing the minimum efficient size of communities. At the same time, migration from outlying to urban areas has combined with the increasing scale and specialization to lower the populations of many political jurisdictions below their minimum efficient size and reduce their fiscal abilities. Moreover, too high a proportion of the migrants go to the core cities where employment opportunities are also meager. Reapportionment has diminished the political representation of both nonurban areas and the central cities, the two locations in which most of the poor are concentrated. And the poor, regardless of location, fail to have an effective political voice.

What were communities in time past, therefore, socially and economically have become neighborhoods within much enlarged communities with large towns or cities as centers, cutting across municipal, county, and

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W. Keith Bryant *is associate professor of agricultural economics at the University of Minnesota.*

sometimes state boundaries. More and more decisions with respect to crucial public facilities and services are made within specialized local districts and specialized public agencies, by-passing local and often state governments to tie directly into federal agencies. Whereas the potential coordinating function of local and state governments is often by-passed, little communication and coordination are visible among federal agencies.

Finally, legislation and federal agencies concerned with development and planning have, by and large, defined areas and regions along problem lines: for instance, labor surplus areas, redevelopment areas, watershed districts. Hence, the economic and social linkages between rural and urban areas which could be utilized in community organization and planning are ignored.

Such were some of the problems confronting the commission. During the commission discussions, a number of goals which it wished to attain emerged. First was the goal of providing the nonurban resident with the access to the public facilities and services that most citizens enjoy. A second goal was to create other alternatives to that of migrating to the 50 largest cities to find employment. Third was the goal of creating organizational structures within which communities can plan, coordinate, and execute the needed private and public sector development. The fourth goal was that of providing means whereby the community can obtain the financial and technical assistance which it needs. The fifth and final goal was to ensure a place for the political power of the poor as well as other interests to develop, focus, and be heard.

A certain set of tactics also emerged during the work of the commission. The first was to utilize rural–urban linkages to define and organize areas for development planning and programming. In this way problem areas would not be isolated, a significant quantity of resources within the area could be marshaled, and more policy variables could be available for manipulation by the area. The commission also recommended that the areas be used as building blocks for multistate regions to replace the present problem-oriented ones.

The commission believed that areas and regions could be defined and organized for effective planning, yet development would be hampered by the disarray in the administrative structures of state and federal agencies. Consequently, the commission urged that state and federal agencies use the areas and regions as administrative areas and regions. Area growth centers and regional capitals could be used to locate area and regional offices of the agencies.

To stimulate the establishment and operation of these areas and regions, it was believed that financial inducements would be more effective than legislative fiat from the federal government. Hence, recommendations were made to build supplementary bonuses into the federal categorical grant-in-aid system, conditional upon the establishment and use of the recommended area development districts and regions. Recommendations for special aid to districts with depressed parts were structured in the same way.

Within each area the commission urged that full use be made of the linkages between the center and periphery in the design and development of the infrastructure. This would involve concentrating the specialized and costly components of the infrastructure in the center to serve the entire area while dispersing the more frequently used components throughout the area in neighborhood centers. It was believed that such a design would maximize access to public facilities and services as well as maximize the potential for area growth, given the fiscal abilities of the area and state and federal aid.

The tactics of stimulating and aiding the geographic flows of both capital and labor were utilized. There were recommendations to augment the present system of industry subsidies and to use federal procurement and investment expenditures to stimulate employment in areas with growth potential. Moreover, programs were recommended to aid the unemployed and underemployed to find jobs and to relocate in the smaller growth centers.

The commission believed that present state and local tax systems, along with the federal categorical grant-in-aid system, would not yield sufficient revenues to meet state and local needs. Yet the commission was loathe to recommend block grants and federal revenue-sharing schemes, such as the Heller–Pechman Plan, at this time. The tactic of the carrot was used again to purchase state and local tax reform, with flexible federal grants to state and local governments.

Finally, to ensure the representation and involvement of the poor in neighborhood as well as areawide decision-making and programming, the commission recommended an organizational structure of community action agencies parallel to and interlocking with the planning and development organization.

Human Resources Development and Rural Poverty

E. WALTON JONES

A MAJOR factor contributing to poverty in the United States is lack of education. In 1960, more than 19 million rural adults had less than a high school education. It is apparent that the bulk of these people do not have the capacity to cope with an increasingly complex social and economic environment. The industrialization and urbanization process in this country has rendered many of these human resources obsolete.

The question might well be asked, "Why, with such a high value associated with education, are there so many who have so little?" Is it the fault of the individual or the system? Part of the blame must be accepted by both parties in a system where a high value is placed on individual choice and initiative. However, it is suggested that a major part of the blame lies at the door of the educational system and the larger society within which this system operates.

If a large part of the blame is to be laid at the door of the educational system, the questions that logically follow are, What is wrong with the system? What steps are being taken to correct the problems? How effective are the actions being taken? What still needs to be done? An equally important question is, What can be done about undereducated adults in our society who, in effect, are victims of the system?

The basic reason for the failure of the educational system in this country to develop human resources fully is the system's identification with the larger society of which it is a part. The educational system, like any other system in this country, is an economizing institution. American society expects every organization utilizing scarce resources to allocate these resources rationally. The larger society sets the standards by which the system is judged.

The educational system, in a way, has been placed in a dilemma by the larger society. Its performance has traditionally been judged by the quality of its output in terms of how many successful people emerge from this institution. A public school prides itself on how many doctors, lawyers, and successful businessmen it has graduated. In order to measure up to this standard, the school system is forced into allocating its resources to those students that respond most effectively to traditional educational processes.

Society forces the public education system, quite unlike private business, to accept at the age of six years the entire bundle of raw human

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E. WALTON JONES *is North Carolina field director of the Coastal Plains Regional Commission.*

resources that exist in the country. A business operation would screen out from the beginning the raw product that has a low capacity for processing into a finished product. If the school system under this situation is rational, it will tend to reject the poor students from the beginning. Institutions of higher learning that are not required to adopt an "open door" policy accept only the better students.

It is my view that the educational system should form a continuum for human resources development—linking up with the home on the one end and society on the other. Assuming that this is the case, one can detect where certain basic weaknesses occur. The continuum breaks down at several points. In the first place, it does not link up with the home effectively. By the time the children from different environments reach the first grade in school, there already exists a tremendous variance in learning and ability to learn. The learning gap between children from deprived environments and those from more affluent environments may be so wide that the school system can never hope to bring the children along at the same pace.

Although the law states that the school system must accept all children into the first grade, it does not charge the system to assist with the learning process at an earlier age. There apparently is a belief that, if a child is forced to stay in the system long enough, learning will take place. In most states the child is legally compelled to stay in school until age 16, regardless of how well he is doing. This is the point where the evidence of poor education shows up dramatically. Studies show that there is a massive spill-out from the educational system when they reach the legal dropout age. This indicates that many stay in the school system awaiting the time when it is permissible to leave.

The educational continuum breaks down again at the end of the high school program. The public education system accepts very little responsibility for tying into the economy or society. Numerous studies have shown where courses being offered in the schools have little relationship to the world of work. This is especially true of rural schools. The school in most instances accepts no responsibility for following up students into the next phase of the educational process or for getting them settled into the economy or society. For those children who have the aspirations and ability to enter institutions of higher learning, there is little problem, since the institutions of higher learning themselves effect the connecting link. However, for those who do not have the capacity to enter institutions of higher learning, little attention is given to moving them into the economy.

Basically, the problem with our educational system in relation to poverty is that it fails to take into account variance among students resulting from environmental factors. The system, by being an economizing system, is forced to work with those students who have the greatest learning capacity and who are most adaptable to the facilities and services at the disposal of the school system. As a result of the functioning of the system in this manner, there is spill-out all the way down the line as students move through various phases of the educational system. The residue who fail to finish the public school system or get into institutions of higher learning are forced to try to enter the economy ill prepared.

The relationship of poor functioning of the educational system to poverty is apparent. Those who fail to get the proper educational experiences attempt to enter the economy on the margins. In an economy operating close to capacity, most of them are able to get into marginal jobs. However, at the first shock wave, they are thrown out of the economy onto the rolls of the unemployed.

The federal government has attempted to cope with the problems of underdevelopment of human resources in recent years through the enactment of several programs that operate outside the educational system. In effect, what has been created is another educational track that picks up students who fall out of the traditional school system. This dual operation is obviously not very efficient. The multitude of fragmented efforts that are neither tied together outside the system nor effectively linked to the system permit the bulk of those who need additional education to fall through the discontinuities. Many of these programs look at the "numerator" of the problem and fail to take into account the "denominator." They do not relate the number that are helped to the number needing help.

The few programs that have been designed to do something about the educational system have failed to recognize the fundamental problem. Most of the programs have looked to supplying additional hardware and more course offerings as a solution to the educational problem. The Coleman report prepared in connection with the Civil Rights Act of 1964 found that physical plant facilities, books, and all the traditional factors associated with quality education have little relationship to whether schools cope with the problems of students from deprived environments. It was found that differences in achievement scores among students within a given school system are four times greater than the differences in the quality of education among school systems. The study showed that a child from a middle-class or upper-class home, for example, will do about as well in a poor school, as it is traditionally defined, as in one of the better schools in the country.

It follows from this that the basic structure of the educational system must be changed. The system must be developed as an effective continuum that identifies with the child in the home, compensates for environmental deficiencies throughout the years of formal schooling, and links up effectively with the economy on the other end. It must not only get the student placed in productive employment, but also follow up and insure that his skills and training do not become obsolete throughout his lifetime. Means must be achieved to insure that there is continuity in the educational processes—in the school, in the home, and in the community.

The recommendations of the Rural Poverty Commission were founded on the basic conviction that the solution to the problem of underdeveloped human resources must be effected through the school system. The system must develop the capacity to cope with the complexities of each personality that enters the system. A completely different philosophy must prevail. This philosophy must be one of not giving up on students because they are difficult to work with. New standards must be developed in the larger society which will permit the school system to have the resources to work effectively with disadvantaged students, even at the expense of those from more privileged environments.

Correcting the basic weaknesses in the educational system will not help the adults who have long since departed the hallowed halls. Undereducated adults must be reclaimed and given the minimum educational experience for them to participate effectively in our technical society. There are millions of rural Americans that must be given basic skills—reading, writing, and arithmetic—before they will be capable of absorbing technical job training.

The commission could see no valid reason for not providing the means for all adults who desire to do so to receive basic educational training. Beyond this, an approximate mix of institutional and on-the-job training should be provided to the entire population who could benefit from such training. The payoff to the individual and society would be such that costs should not be a limiting factor.

In conclusion, the full educational development of human resources is one of the most important means of coping with the challenge of rural poverty. The magnitude of the task and the need for continuity demand that it be accomplished through the educational system. A great danger lies in the temptation to initiate programs outside of the system in order to gain immediate visibility. The patchwork of educational and manpower programs that have been created in this country will serve no other end than add to the frustration of already frustrated people.

SOURCES AND DETERMINANTS OF INCOMES OF FARM FAMILIES

CHAIRMAN: LUTHER TWEETEN, OKLAHOMA STATE UNIVERSITY

Personal Distribution of Farmers' Income by Source and Region*

JOSEPH D. COFFEY

PER capita money income of farmers is a very inadequate measure of either the productivity or welfare of farm people. One reason for its inadequacy is the highly skewed distribution of farmers' income. Thus, in the first part of this paper, we will compare the distribution of farm and nonfarm money income and indicate the substantial differences that exist. A second reason for the inadequacy of per capita money income is that an important share of farm income accrues in the form of nonmoney income and the appreciation of land values. The second part of this paper, therefore, will be devoted to a more thorough examination of the distribution of the various sources of farm income.

Before examining the data, however, it is necessary to mention briefly some of the difficulties involved in interpreting income distribution data. The fundamental problem is, of course, that we need a social welfare function, not only to judge which distribution is "better" than another, but also to specify the appropriate (1) measure of income distribution (such as the Gini coefficient versus the coefficient of variation), (2) income concept (permanent versus transitory income), (3) recipient unit of analysis (per capita versus per family), and (4) period of income accumulation (year versus lifetime) [1, 9, 11]. Even if these problems could be resolved, we undoubtedly would lack adequate data. Detailed income data for the same individuals or families over a period of time are especially needed.[1] Nevertheless, despite the serious problems involved, we now know much more about the distribution of income than previously, and we would be derelict if we did not attempt to enlighten ourselves as much as possible.

Farm vs. Nonfarm Money Income Distribution

The pioneering work of Kuznets [10, 11] suggested two hypotheses concerning the distribution of income. The first is that income becomes

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[1] The continuous registry social security data appear to be a promising source [7].

JOSEPH D. COFFEY *is assistant professor of agricultural economics and assistant economist in the Experiment Station and on the Giannini Foundation at the University of California, Berkeley.*

more evenly distributed during the later periods of economic growth when incomes increase. The second hypothesis is that income is more equally distributed within the agricultural sector than within the nonagricultural sector.

Two types of evidence, for the United States at least, are consistent with the first hypothesis. First, money income distributions for the United States indicate some decrease in inequality during the 1930's and 1940's [12, pp. 15–26; 23]. For example, Miller reports "that there was a reduction of inequality in the distribution of income between 1940 and 1950, but little, if any, change in this respect during the following decade" [12, p. v]. Also, the data for all families for 1948–1964 in Figure 1 suggest at least that inequality, as measured by the Gini ratio, did not increase.[2]

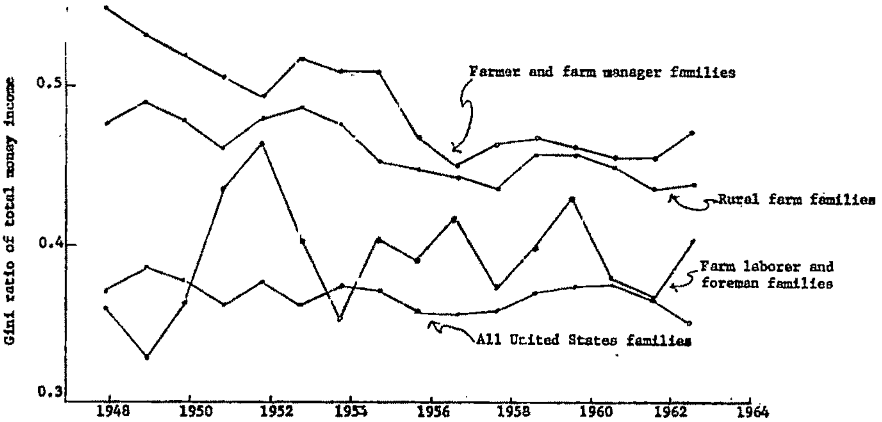

Figure 1. Gini ratio of total money income of families, 1948–1964

Sources:

Farmer and farm manager families, rural farm families, and farm laborer and foreman families from Boyne [5, p. 1221].

All United States families fom U.S. Bureau of the Census [19, Table 29].

The second type of data which lends support to the first hypothesis is cross-sectional data on money income of the total population by states. The studies by Williamson [23], Al-Samarrie and Miller [3], Aigner and Heins [1 and 2], and Verway [22] indicate that money income is more equally distributed in those states with high per capita incomes and less equally distributed in those states with low per capita incomes. Thus, considerable evidence exists which supports the hypothesis, both cross-sectionally and, to a lesser extent, over the course of time, that per capita money income and equality of money income distribution are positively correlated.

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[2] The Gini ratio is defined as the proportion of the total area below the diagonal line of perfect equality: that is, between the diagonal and the Lorenz curve [19]. The greater the Gini ratio, the greater the inequality.

The second hypothesis, that income in the agricultural sector is more evenly distributed than in the nonagricultural sector, is inconsistent with available evidence. Miller concludes:

> There is no evidence . . . that urban incomes are more unequally distributed than rural incomes. In fact, for the money income figures . . . the reverse is evidently true. But even when total income is used, farm incomes appear to be more unequally distributed than urban incomes. The idea that farm incomes are more equally distributed than nonfarm incomes . . . is without solid foundation [12, p. 22].

Miller's findings are consistent with those of Boyne, who found that the inequality of money "income distribution for farmer and farm manager families was greater than for any other occupational group identified by CPS income surveys" [5, p. 1223].

The greater inequality of money income distribution in agriculture is evident in Figure 1. Whereas the Gini ratio for the total population has been about 0.35, that for the farmer and farm manager families and rural farm families has consistently been about 0.45 or greater. Furthermore, there appears to be a greater year-to-year fluctuation in the income distribution of the farm groups. The income distribution of the farm laborer and foreman families has been particularly unstable. The income distribution for the farmer, farm manager, and rural farm family group exhibits some tendency to become less unequal from 1948 to 1956; however, the 1956–1963 period exhibits no clear trend.

The more disaggregated data for 1964 in Tables 1 and 2 also indicate substantial differences in the distribution as well as in the median money income between farm and all families. The percentage of farm families with money incomes below $3,000 is two to four times greater than the percentage of metropolitan and nonfarm resident groups (Table 1). In the 26 detailed categories by color, wife's working status, age of head, size of family, number of related children, and number of earners, there is only one exception to the finding that money incomes of farm families are both lower and more unequally distributed than those of all families (Table 2). However, there does not appear to be any systematic relationship between the level of money income and its distribution either among the various farm family groups or relative to all families. For example, the Gini ratio is not consistently higher for those farm family groups with low median incomes; nor does the ratio of Gini ratios and mean incomes of farm families to all families move together.

We conclude that money income of farm families is more unequally distributed than that of all families. This does not appear to be attribut-

Table 1. Distribution and median total money income of families by metropolitan–nonmetropolitan residence, United States, 1964

Total money income	All families	Metropolitan			Nonmetropolitan		
		Total	In central cities	Outside central cities	Total	Non-farm	Farm
				percent			
Under $1,000	3.2	1.9	2.2	1.7	5.6	4.3	11.7
$ 1,000 to $1,999	6.3	4.2	5.2	3.4	9.9	8.8	15.8
$ 2,000 to $2,999	8.1	6.4	7.7	5.2	11.1	10.0	17.0
$ 3,000 to $3,999	8.4	7.0	8.6	5.4	10.9	10.7	12.2
$ 4,000 to $4,999	8.6	7.7	8.8	6.7	10.3	10.4	9.4
$ 5,000 to $5,999	9.9	9.7	10.5	9.0	10.3	10.7	8.1
$ 6,000 to $6,999	9.9	10.1	10.0	10.3	9.3	9.9	6.7
$ 7,000 to $7,999	9.3	9.9	9.1	10.7	8.2	8.7	5.7
$ 8,000 to $8,999	7.6	8.2	7.3	9.0	6.4	7.3	2.4
$ 9,000 to $9,999	6.3	7.1	6.3	7.7	4.8	5.2	3.0
$10,000 and over	22.5	27.7	24.3	30.8	13.1	14.1	8.1
Total[a]	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Median income	$6,569	$7,290	$6,697	$7,772	$5,208	$5,542	$3,414

[a] Because of rounding errors, columns may not add to exactly 100 percent.
Source: U.S. Bureau of the Census [17, p. 3].

able to the differences in family characteristics for which we have data, since the same conclusion holds for the more detailed comparisons. However, the discussion so far pertains only to money income for all states. We now extend the analysis to include both the money and nonmoney components of farm income and regional differences.

Distribution of Total Farmers' Income

In order to explore in more detail the factors which might contribute to the inequality of the farm income distribution, the composition of state variations in "total farm income" (X_1) will be analyzed.[3] The hypothesis is that if some of the individual components of farm income are distributed more unequally than others, then interregional differences and shifts over the course of time in the composition of farm income could explain some of the forces affecting the distribution of farm income. An additional hypothesis is that the distribution of nonmoney income and real wealth gains, which are not included in the comparisons of the previous section, may tend to mitigate the apparent differences of money income distribution between the farm and all families. But this would require constructing parallel estimates for the nonfarm sector and taking into consideration

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[3] Only the preliminary census reports [18] and the detailed volumes [16] for 18 states were available at the time this study was initiated. The explanation of the income components is in the appendix.

Table 2. Comparison of distribution and mean of money income of farm families with those of all families, United States, 1964

Family characteristics	Gini ratio		Mean income	
	Farm families	Ratio of farm families to all families	Farm families	Ratio of all families to farm families
		percent	*dollars*	*percent*
All	0.433	123	4,670	159
White	0.417	119	4,915	157
Nonwhite	0.434	109	2,167	220
Male head	0.421	123	4,690	166
Married, wife present	0.421	124	4,707	166
Wife in paid labor force	0.352	121	6,098	145
Wife not in paid labor force	0.435	119	4,327	169
Age of head				
25–34	0.373	128	4,421	158
35–44	0.401	127	5,647	147
45–54	0.433	131	5,220	168
55–64	0.429	113	4,341	181
65 and over	0.466	99	3,669	144
Size of family				
2 persons	0.444	109	3,734	169
3 persons	0.414	123	4,894	155
4 persons	0.408	131	5,556	150
5 persons	0.438	139	5,203	160
6 persons	0.417	124	5,230	160
7 or more persons	0.420	118	5,016	147
Number of related children under 18 years				
None	0.438	111	4,283	167
1	0.453	134	5,268	144
2	0.407	129	5,305	150
3	0.394	124	4,401	178
4	0.447	133	5,217	146
Number of earners per family				
1	0.448	124	3,855	176
2	0.379	128	5,225	158
3 or more	0.389	136	6,654	158

Source: U.S. Bureau of the Census [19, pp. 170–195].

purchasing power differences, a task which is beyond the scope of this paper.[4]

Total farmers' income, as defined in this study, includes nonmoney income as well as the value of real wealth gains (X_{16}) from increases in the value of farmland. Some may object to the inclusion of real wealth gains in income on the grounds that they may not be "realized." But as Boyne emphasizes [6], "unrealized" gains may have impacts on behavior similar to those of realized ones, since they may be an alternative form of saving.

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[4] For a discussion of the difficulties involved and the results to date, see Ruttan [15, pp. 1107–08] and Miller [12, p. 6].

The relative composition of total farmers' income has undergone several changes in the 1948–1964 period (Table 3). There has been a decrease in the relative importance of nonmoney income (X_5) and net receipts from farm sales (X_8), and a relative increase in farm program payments (X_3). Although real wealth gains have fluctuated greatly, they have accounted for over 10 percent of total farmers' income 11 times during the 17-year period of 1948–1964.

Table 3. Percentage composition of per-farm income, United States, 1948–1964

Years	Net receipts from farm sales (X_8)	Non-money income (X_5)	Farm program payments (X_3)	Net farm income (X_6)	Real wealth gains (X_{16})	Income from nonfarm sources ($X_7 - X_3$)	Disposable income (X_2)	Personal tax and nontax payments (X_{10})	Total farmer's income (X_1)
	1	2	3	4	5	6	7	8	9
					percent				
1948	52.4	16.8	1.0	70.2	6.7	23.1	93.5	6.5	100
1949	49.1	20.0	1.0	70.1	−4.1	34.0	93.8	6.2	100
1950	38.0	13.5	1.1	52.6	23.2	24.2	96.2	3.8	100
1951	43.1	14.3	1.1	58.5	17.7	23.8	96.2	3.8	100
1952	47.9	17.5	1.2	66.6	3.6	29.8	93.9	6.1	100
1953	48.8	20.2	1.1	70.1	−4.7	34.6	91.7	8.3	100
1954	43.1	17.2	1.3	61.6	9.2	29.2	92.1	7.9	100
1955	38.4	16.8	1.1	56.3	13.2	30.5	93.7	6.3	100
1956	34.0	14.8	2.5	51.3	19.1	29.5	94.3	5.6	100
1957	33.5	15.5	4.8	53.8	14.7	31.5	93.8	6.2	100
1958	36.1	13.4	4.3	53.8	19.5	26.7	94.8	5.2	100
1959	29.6	12.9	2.7	45.2	26.9	27.9	94.3	5.7	100
1960	40.4	16.0	3.4	59.8	4.3	35.9	93.3	6.7	100
1961	35.4	13.6	5.4	55.4	14.8	29.8	93.9	6.1	100
1962	35.5	13.5	7.5	56.5	13.3	30.2	93.6	6.4	100
1963	28.3	13.5	9.2	51.0	20.0	29.0	94.0	6.0	100
1964	28.3	13.4	9.1	50.8	20.9	28.3	93.9	6.1	100

Source: See Appendix.

The weighted coefficient of variation (V) is used as a measure of the income distribution. It measures the deviation of state per-farm averages from the national (or regional) per-farm average (weighted by the number of farms per state) relative to the national (or regional) per-farm average. The greater the value of V, the greater the inequality of income. It should be noted that V measures only the among-state variation and excludes the within-state variation, which we were unable to obtain. On the basis of previous work by Williamson [23], it appears that for all United States families' median money income, V ranges from 10 to 15 percent for regional groupings of states with high per capita incomes and from 20 to 30 percent for groupings of states with low per capita incomes. Unfortunately, we do not have comparable income data for the nonfarm sector to contrast with total farmers' income. The ranges in V do, however, provide some crude bench marks.

There are large differences in the coefficients of variation for the various farm income components (Table 4). For the United States, V is only 35 percent for nonmoney income and 23 percent for income from nonfarm sources, but is 112 percent for real wealth gains and 94 percent for net receipts from farm sales. Thus, shifts in the composition of income could have sizable impacts upon the distribution of total income.

The following example illustrates the impact of changes in the relative composition of total farmers' income (X_1) on the distribution of income (V). The relative importance of income from nonfarm sources ($X_7 - X_8$) has increased from about 20 percent to 30 percent during the 1948–1964 period (Table 3), and the relative importance of income from farm sources ($X_1 - X_7 + X_8$) has correspondingly decreased from 80 percent to 70 percent. Assuming that real income per farm has, during this period, increased from $5,000 to $7,000, the effect of this change in income composition, taking into account the differences in respective V's as well as their covariation, would be to lower V from 58 percent to 37 percent, or by about a third. This example is somewhat misleading in that the composition of income from farm sources ($X_1 - X_7 + X_8$) has changed and, therefore, its variance has undoubtedly changed (increased) during the 1948–1964 period. Perhaps it has increased enough to offset the decline which the example indicates.

The coefficient of variation was computed for four alternative groupings of states to explore further the forces affecting the distribution of income.[5] The geographical grouping (North Atlantic, North Central, South, and Western regions) was constructed to reflect differences by type-of-farming areas. It is evident that there are substantial differences in the distribution of the individual components among regions, but there does not appear to be any systematic pattern.

The four sets of states grouped according to high- and low-income levels and growth rates of per capita income of all persons was prompted by the analysis of Okun and Richardson [13]. This grouping indicates that income tends to be more evenly distributed in those groups of states with high per capita income growth rates.

The four regions obtained by combining the states according to the level of per-farm income produces a surprising result. Contrary to expectations, the regions with the highest per-farm income tend to have the most unequal distribution of total farmers' income. Indeed, this same finding appears to hold also for the other alternative groupings. This inverse

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[5] The state groupings are in the appendix table.

Table 4. Per-farm distribution (V) and average ($\bar{X}$) of selected income components, by regions, United States, 1964

Income component	United States		Geographical regions								Income and growth regions							
			North Atlantic (G_1)		North Central (G_2)		South (G_3)		Western (G_4)		Low-stagnant (LS)		Low-growth (LG)		High-stagnant (HS)		High-growth (HG)	
	V	$\bar{X}$	V	$\bar{X}$	V	$\bar{X}$	V	$\bar{X}$	V	$\bar{X}$	V	$\bar{X}$	V	$\bar{X}$	V	$\bar{X}$	V	$\bar{X}$
	percent	*dollars*	*percent*	*dollars*	*percent*	*dollars*	*percent*	*dollars*	*percent*	*dollars*	*percent*	*dollars*	*percent*	*dollars*	*percent*	*dollars*	*percent*	*dollars*
Net receipts from farm sales (X_8)	94	2,129	66	1,536	46	1,542	71	2,301	106	4,308	91	2,220	77	2,293	103	2,438	37	1,064
Nonmoney income (X_5)	35	1,014	20	1,803	22	922	20	881	28	1,404	38	847	21	909	38	1,208	19	982
Farm program payments (X_8)	79	688	27	250	56	1,038	62	387	60	877	43	1,145	60	316	72	759	54	1,041
Net farm income (X_6)	56	3,832	31	3,589	25	3,503	48	3,570	71	6,590	53	4,213	52	3,518	60	4,406	22	3,087
Real wealth gains (X_{16})	112	1,394	59	878	79	1,025	84	1,455	11	3,081	59	2,460	89	1,092	14	1,543	75	974
Income from nonfarm sources (X_7-X_3)	23	3,181	79	3,571	22	2,999	17	3,040	22	4,296	26	3,268	15	2,912	25	3,495	19	3,088
Disposable income (X_2)	50	7,261	17	7,380	19	6,150	37	7,205	68	12,156	44	8,300	38	6,759	59	8,148	20	5,814
Personal tax and nontax payments (X_{10})	77	458	39	408	37	339	57	474	83	933	76	495	63	447	83	536	44	295
Total farmers' income (X_1)	51	7,720	18	7,788	20	6,488	38	7,678	69	13,090	46	8,796	40	7,206	60	8,684	21	6,109

Table 4. (Continued)

Income component	Per-farm income regions								Income inequality regions							
	Highest (F₁)		Next to highest (F₂)		Next to lowest (F₃)		Lowest (F₄)		Least unequal (U₁)		Next-to-least unequal (U₂)		Next-to-most unequal (U₃)		Most unequal (U₄)	
	V	$\bar{X}$	V	$\bar{X}$	V	$\bar{X}$	V	$\bar{X}$	V	$\bar{X}$	V	$\bar{X}$	V	$\bar{X}$	V	$\bar{X}$
	per-cent	*dol-lars*	*per-cent*	*dol-lars*	*per-cent*	*dol-lars*	*per-cent*	*dol-lars*	*per-cent*	*dol lars*	*per-cent*	*dol-lars*	*per-cent*	*dol-lars*	*per-cent*	*dol-lars*
Net receipts from farm sales (X_9)	76	4,457	34	1,819	46	1,718	50	883	45	1,335	122	2,722	78	1,989	73	2,351
Nonmoney income (X_5)	51	1,038	36	1,010	20	970	32	1,080	27	1,184	32	1,239	40	974	18	832
Farm program payments (X_3)	63	992	58	1,058	52	427	61	374	51	603	68	846	75	955	58	432
Net farm income (X_8)	53	6,488	13	3,888	21	3,116	24	2,337	26	3,123	70	4,808	45	3,918	50	3,616
Real wealth gains (X_{16})	95	2,760	58	1,834	57	688	88	731	72	651	12	2,182	91	1,004	74	1,685
Income from nonfarm sources ($X_7 - X_8$)	31	3,236	20	3,398	16	2,829	16	3,520	17	3,659	32	3,373	15	2,847	18	3,090
Disposable income (X_2)	61	10,686	21	7,610	17	5,867	14	5,883	14	6,434	71	8,957	36	6,425	38	7,467
Personal taxes and nontax payments (X_{10})	78	806	37	452	34	339	29	331	24	396	11	560	61	389	59	492
Total farmers' income (X_1)	62	11,491	22	8,062	18	6,206	15	6,214	15	6,831	74	9,517	37	6,814	40	7,959

Sources: See Appendix.

relationship between equality and level of income, if confirmed by a more detailed analysis, is the most puzzling since it contradicts the cross-sectional findings for the entire population.

The fourth set of regions, which is based upon the inequality of the distribution of family money income for all persons, reveals that those regions having the most unequal distribution of family money income of all persons do not necessarily have the most unequal distribution of farm income.

In summary, when we disaggregate farm income by source and region, the following pattern of income distribution emerges. The distribution of net receipts from farm sales establishes the basic pattern of the unequal distribution of total farmers' income. This pattern, in most regions, is reinforced by the unequal distribution of farm program payments and real wealth gains, which, in turn, are interrelated since farm programs contribute to increases in land values [4] and, thus, real wealth gains. For most regions, nonmoney income and income from nonfarm sources are more evenly distributed than the other sources of farm income. Personal tax and nontax payments (X_{10}) are progressive, that is, they are more unevenly distributed than total farmers' income; but their impact is relatively small, since disposable income (X_2) is only slightly less evenly distributed than total farmers' income.

Conclusions

The distribution of money income is more unequal for farm families than it is for all families. This does not appear to be caused by the differences attributable to color, age, family size, working status of wife, or number of earners per family. In a search for explanations of the farm income inequality, the distribution of the individual components of farm income by region were investigated. The components of income, which apparently are largely responsible for the unequal distribution of income of farm families, are the net receipts from farm sales, farm program payments, and real wealth gains. The effect of farm programs would appear to be especially pervasive, since it is well established that much of their benefits is capitalized into farmland values [4] and, thus, have contributed to real wealth gains. Nonmoney income and income from nonfarm sources are more evenly distributed than the other sources of farm income.

Thus, the findings of this study are consistent with those of others who suggest that, despite expensive farm programs and massive out-migration, poverty problems continue to plague farm families in disproportionate numbers [7, 14]. The mounting chorus of voices raising questions about prevailing approaches to farm problems will, we may hope, contribute to a better understanding of the forces underlying the problem of unequal incomes in agriculture and bring about needed changes.

Appendix

Explanation of Symbols and Sources of Data[6]

Symbol

X_1 Total "personal" income of members of farm operators' households.

$$X_1 = X_{16} + X_7 + X_6 - X_3.$$

(Note: X_3 is included in both X_7 and X_6 and so the double-counting is eliminated by this subtraction. X_1 is *not* equivalent to the national accounts definitions, since we have included X_{16} and social insurance payments.)

X_2 Total income of persons in farm operators' households, less taxes, that is, "disposable personal" income of members in farm operators households.

$$X_2 = X_1 - X_{10}.$$

X_2 is *not* equivalent to the national accounts, since we have included X_{16} and social insurance payments.

X_3 Government farm program payments [20, p. 80].

X_4 Farm property taxes [20, p. 75].

X_5 Nonmoney farm income, that is, value of home consumption plus gross rental value of farm dwellings [20, pp. 13–38].

X_6 Total net farm income of farm operators [20, pp. 15–38].

X_7 Income of all members in farm operators' households from sources other than farm operated [18, p. 2].

X_8 Net cash receipts from farm sales.

$$X_8 = X_6 - X_3 - X_5.$$

X_9 Number of people in farm operators' households [13, p. 3].

X_{10} Personal tax and nontax payments of farm population.

$$X_{10} = (X_6 + X_7 - X_3 - X_5 - \$600 \cdot X_9)t,$$

where tax rate,

$$t = \frac{\$1.444 \text{ billion}/X_{12}}{(X_6 + X_7 - X_3 - X_5) - \$600 \cdot X_9}.$$

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[6] All variables are per-state, per-farm, or per-household averages for 1964 unless otherwise noted in the explanation.

Appendix Table. Definition of regional groups of states

Criteria and regions	Symbol	Number of states	States
Geographical			
1. North Atlantic	G_1	11	Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, and Maryland.
2. North Central	G_2	12	Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas.
3. South	G_3	14	Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas.
4. Western	G_4	11	Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, and California.
1964 income and 1948–1963 growth rate[a]			
1. Low income–stagnant	*LS*	8	North Dakota, South Dakota, Texas, Montana, Idaho, Wyoming, Arizona, and Utah.
2. Low income–growth	*LG*	16	Maine, Vermont, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and New Mexico.
3. High income–stagnant	*HS*	17	Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Ohio, Illinois, Michigan, Wisconsin, Iowa, Nebraska, Delaware, Maryland, Nevada, Washington, Oregon, and California.
4. High income–growth	*HG*	7	New Hampshire, Massachusetts, Indiana, Minnesota, Missouri, Kansas, and Colorado.

The tax rate, t, is ratio of personal tax and nontax payments ($1.444) on a per-farm basis to money income from farm and nonfarm sources, less the $600 tax exemption. Personal tax and nontax payments of farm population are from the *Farm Income Situation* [20, p. 42].

X_{11} Percentage price change, March 1964 to March 1965, in land and building values, less 2-percent adjustment for inflation [21, p. 5].

X_{12} Number of farms, which also equals number of farm operators [20, p 2].

X_{13} Value of land and buildings [18, p. 2].

X_{14} 1962 percentage which farmland is of total value of land and buildings [8, pp. 17–18].

X_{15} Percentage of the total value of farmland and buildings owned by 1964 farm operators which they purchased prior to 1963. This was estimated for the 30 states whose data were not available as the averages of the states in the same geographical region whose data were available [16, Table 25].

X_{16} Real wealth gains from land for farm operators.

$$X_{16} = (X_{15})(X_{11})(X_{14})(X_{13}).$$

Criteria and regions	Symbol	Number of states	States
1964 per-farm income[b]			
1. Highest fourth	F_1	12	Maine, Connecticut, New Jersey, Illinois, Iowa, Nebraska, Delaware, Florida, Arkansas, New Mexico, Arizona, and California.
2. Next-to-highest fourth	F_2	12	Massachusetts, New York, Indiana, North Dakota, South Dakota, Kansas, Georgia, Texas, Montana, Idaho, Colorado, and Washington.
3. Next-to-lowest fourth	F_3	12	Vermont, Ohio, Wisconsin, Minnesota, Missouri, Maryland, North Carolina, South Carolina, Kentucky, Alabama, Mississippi, and Louisiana.
4. Lowest fourth	F_4	12	New Hampshire, Rhode Island, Pennsylvania, Michigan, Virginia, West Virginia, Tennessee, Oklahoma, Wyoming, Utah, Nevada, and Oregon.
Gini inequality of 1959 money income distribution[c]			
1. Least-unequal fourth	U_1	12	New Hampshire, Connecticut, New Jersey, Ohio, Indiana, Michigan, Wisconsin, Montana, Idaho, Wyoming, Utah, and Washington.
2. Next-to-least-unequal fourth	U_2	12	Maine, Massachusetts, Rhode Island, Tennessee, Illinois, Minnesota, North Dakota, Maryland, Colorado, Nevada, Oregon, and California.
3. Next-to-most-unequal fourth	U_3	12	Vermont, New York, Iowa, Missouri, South Dakota, Nebraska, Kansas, Virginia, West Virginia, North Carolina, New Mexico, and Arizona.
4. Most-unequal fourth	U_4	12	Delaware, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas.

[a] Based upon two-way classification of states by 1964 per capita personal income and percentage change in per capita personal income from 1948 to 1963. G and S mean, respectively, growth rate above and below United States average: H and L mean per capita personal income above and below United States average.

[b] Grouped according to 1964 realized net income per farm, by states [20, p. 11].

[c] States arranged into four groups according to the size of the Gini ratio in Verway [22, p. 317].

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Discussion: Personal Distribution of Farmers' Income by Source and Region

PAUL W. BARKLEY

For discussion purposes, Mr. Coffey's paper needs to be turned exactly end to end. As a final note, Mr. Coffey suggests: "Hopefully, the mounting chorus of voices raising questions about prevailing approaches to farm problems will contribute to a better understanding of the forces underlying the problem of inequal incomes in agriculture and bring about needed changes." There is unquestionably a mounting chorus but, like the musical score of Ravel's "Bolero," the chorus seems to be little more than a mounting crescendo consistently and constantly repeating the same theme. Mr. Coffey's paper offers suggestions of variations on this theme but, I think, the limits of his research to this date have not permitted the substantial breakthroughs that are needed. The paper is not without merit and it raises points that need some scrutiny. Take them one by one.

PAUL W. BARKLEY *is associate professor of agricultural economics at Washington State University.*

1. Referring to money income, Coffey concludes that farm families have much more inequality among their incomes than do all families of the nation. This theme is made more incisive when Coffey indicates that no matter how he examines his data—viewing family characteristics, for example—the result is still the same. A chilling conclusion is warranted: The farm families of this nation include high and low income groups. These highs and lows are more distantly separated than the highs and lows for the economy as a whole. These more intense highs and lows seem not to be traceable to or identifiable with special groups in agriculture. They appear everywhere. The upshot might be the recommendation of solving the rural poverty problem through a general agricultural program. Our experience with general agricultural programs leaves something to be desired. New departures are warranted.

2. The noncash-income theme is elaborated by Coffey, using nonmoney income (the value of home-produced goods which are consumed at home and the rental value of the house) and real estate appreciation. The inclusion of these items as part of a study of income distribution is essential—they do, after all, appear on personal balance sheets and on loan applications. Perhaps, however, while we have made progress in measuring these contributions to farm income, we have not kept pace in gaining understanding of how these parts of a farmer's income are translated into his decision frame and how readily the paper appreciation can be converted into cash. It is likely a small comfort to the 44.5 percent of the nation's farmers who in 1964 had incomes of $3000 and below to know that their incomes might have been increased by 20 percent had they only known the value of their assets. Here is a task not only for researchers but also for extension workers and policy-makers. Knowledge of the relationships between cash and noncash incomes is of only curiosity value unless the transfer between the two can be readily affected.

3. In discussing the distribution of total (cash and noncash) incomes, Coffey concludes that nonmoney incomes and real-wealth gains reinforce or contribute to income inequality among farmers. This is a disquieting if not surprising conclusion. Taken to its logical end, it says that no questions can be ducked by thinking that noncash income will, when properly accounted for, remove inequality of income in agriculture. It says the reverse and thus makes the research job more complex. Time spent on this issue could hardly help but turn up a dozen researchable themes of which a few would undoubtedly pay off.

In sum, to this point I have mentioned three notions brought up by Coffey and, though picking here and there, I have essentially agreed with the author of the major paper. Turn now to one of Mr. Coffey's opening remarks: "The fundamental problem is . . . that we need a social welfare function not only to judge which distribution is 'better' than another but also to specify the appropriate (1) measure of income distribution (Gini coefficient versus coefficient of variation, etc.); (2) income concept (permanent versus transitory income); (3) recipient unit of analysis (per capita versus per family); and (4) period of income accumulation (year versus lifetime)." This particular plea appears quite consistently in the literature on income distribution problems. It is no doubt true that the world will beat a path to the door of the economist who first devises such a function. It is likely that some day such a function will exist, but this day is probably quite distant. In the meantime, people go to bed hungry and mortgages are foreclosed. A social welfare function is needed for precision, but precision is a luxury which can be dispensed with at this point in the development of the American economy when the orientation is income distribution. The main path of income distribution research has been descriptive. It is as if we don't believe the truly impressive documents published by the Commission on Rural Poverty—we need to see for ourselves. The front runners in this arena should be accepting this as fact and struggling to find direct and immediate ways to remedy a very difficult circumstance. Although a social welfare function would be a great comfort to each of us, we can do a good deal of work without it. Mr. Coffey's work is highly valuable for its examination of the validity of widely held hypotheses. It is inconclusive in many places when we would like more conclusive evidence. We can only hope that time will permit Mr. Coffey to maintain activity in these veins and return another year with more evidence and more indications useful to policy-makers.

Adding pluses and minuses, Mr. Coffey surely deserves a plus for the way in which he has approached his objectives. I will not rate him minus, but I will at least leave open the question as to whether these are the objectives most deserving of examination at this time.

Poverty by Color and Residence—Projections to 1975 and 1980*

J. PATRICK MADDEN

THUS far in the 1960's, the number of poor has been steadily declining. The relatively favorable economic environment—as reflected by the declining unemployment rate, rapid growth rate, and rising median income—has played an important role in this improvement. Recent monetary and fiscal policy actions at the national level have been designed to curb the rapidly rising aggregate demand as a means of reducing inflationary pressure. These actions are bound to worsen the economic environment from the standpoint of many low-income people. In particular, the 10-percent tax surcharge is expected to retard the rise in aggregate demand and the demand for labor enough to raise the unemployment rate from its current level of 3.5 percent to 4.5 percent. How would this affect the poverty trends? The purpose of this paper is to project to 1975 and 1980 the incidence of poverty among various subgroups of the poor, under alternative assumptions regarding the state of the economic environment.

The Poverty Criterion

For purposes of this paper, a family is defined to be in poverty in a given year if its income in that year is less than \$3,000, in constant 1964 dollars (that is, \$2,159 in 1947 or \$3,139 in 1966, in current dollars.)[1] Likewise, the incidence of poverty in a given subgroup of families for a specific year is the percentage of such families having too little income to afford the same amount of goods and services that \$3,000 could buy in 1964.

This measure of the incidence of poverty is admittedly crude.[2] But it has the offsetting virtue of being available in long time series necessary for the analysis presented here. Furthermore, another analysis of this type [1] suggests that the general conclusions would not be different if we used the more elaborate poverty thresholds developed by Mollie Orshansky in the Social Security Administration [10], The Orshansky poverty thresholds vary by family size, type, and farm–nonfarm residence, and they are centered near a \$3,000 income for a four-person family, adjusted upward each year for the rising cost of the basic food plans.

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[1] The analysis presented here deals entirely with families. Unrelated individuals are ignored, though a similar analysis could easily be done on data for those persons.

[2] Many weaknesses of using annual reported income as the poverty criterion could be listed,

J. PATRICK MADDEN *is associate professor of agricultural economics at Pennsylvania State University.*

Poverty runs much deeper than the purse. The deeper aspects of poverty are not erased simply by raising a family's income above $3,000. Much more income than this is needed in most cases, even though dollars alone are not the whole answer. Certainly the bundle of goods and services which a family can acquire with $3,000 is grossly inadequate according to modern American standards.[3] Nonetheless, trends in the percentage of families with income under $3,000 (in constant 1964 prices) provide a useful indicator of material progress, showing us which groups are standing still and which ones are moving most rapidly toward what society would deem an acceptable level of living.

Previous Poverty Projections

Projections of the poverty situation range from darkly pessimistic to highly optimistic. For example, Lampman's analysis [5] showed that the poverty situation was approaching a state of near-stagnation. He estimated that by 1970 fully 16 percent of all families would still be in poverty (compared to 17.5 percent in 1964) and that by 1975 the percentage would fall only slightly—to 14 percent. Thus, he concluded that very little improvement could be expected without massive antipoverty programs.

Lampman's poverty projections must be taken as inconclusive because of the nature of his method and his data. His method was simply to project the 1962 income of each population group (for example, whites and nonwhites) at the rate of 2.5 percent a year to 1970 and 1975 and then to estimate what percentage of families in each group would still have incomes under $3,000. He did not consider the effects of alternative national economic policies related to the growth rate, aggregate demand, and employment. Nor did he recognize the possibility that some population groups may have a much slower rate of income growth (particularly in times of unfavorable economic conditions) and consequently a slower emergence from poverty.

In its 1964 report [13], the Council of Economic Advisors projected the poverty situation to 1980, using alternative rates of growth and unemployment. Their conclusions were roughly consistent with those of Lampman. Using alternative assumptions of favorable and unfavorable economic conditions, the Council projected a considerable difference in incidence of pov-

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but these are beyond the scope of the present paper. One important limitation of today's poverty statistics that should be kept in mind is that they are cross-sectional, based on one point in time, with no comparison of each family's income in other years. Longitudinal data would permit a precise distinction between temporarily low income situations and lifelong situations.

[3] A comparison with the Labor Department's "modest but adequate" family budget—currently valued at $9,200—shows that the poverty line is increasingly less adequate over the course of time [15, p. 2].

erty: 10 percent versus 13 percent. These findings demonstrated the necessary-but-not-sufficient nature of a favorable economic environment.

Gallaway [3] reached conclusions far more optimistic than those of Lampman and the Council[4] Gallaway used the Council's own assumptions regarding favorable versus unfavorable economic conditions, but he came up with much lower poverty projections. He projected the U. S. poverty rate to 12.6 percent by 1970 and to 6.4 percent by 1980, assuming relatively favorable economic conditions (a 4-percent unemployment rate and the 1947–1956 average growth rate of 2.98 percent). Assuming less favorable conditions (6-percent unemployment coupled with the 1957–1963 growth rate of 2.18 percent), Gallaway anticipated a somewhat higher rate of poverty in 1980—8.7 percent. Thus, Gallaway contended that a very favorable economic environment would all but eliminate poverty, with no need for special antipoverty programs other than transfer payments to the relatively small number of poor irrevocably consigned to the "backwash" of the economy.

Gallaway's model was essentially the following:

$$\underline{P}_t = f(\underline{M}_t, \underline{U}_t), \tag{1}$$

where

$\underline{U}_t$ is the national unemployment rate for persons aged 16 and over during year t,[5]

$\underline{M}_t$ is the median income of all U. S. families in year t, and

$\underline{P}_t$ is the percentage of all U. S. families in poverty during year t.

Using time-series data for the years 1947 to 1963, Gallaway fitted a semilog regression. He plugged the assumed values of $\underline{U}$ and $\underline{M}$ into the resulting equation to project poverty rates to 1970 and 1980.

Aaron [1] raised several questions as to the validity of Gallaway's procedures and results. First, Aaron demonstrated that aggregate poverty statistics, representing the nation as a whole, are too crude a tool for projecting poverty trends, because some groups of population gain relatively little from improving economic conditions. Aaron showed that white-family poverty is more sensitive to the national unemployment rate than is nonwhite-family poverty. Furthermore, he showed that Gallaway's results are sensitive to the form of equation used in the regressions; the semilogarithmic form, according to Aaron, tends to overstate the impact of rising incomes on the incidence of poverty, thus giving poverty projections that are biased downward. Gallaway has agreed with this criticism.

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[4] The poverty criterion used by Lampman and the Council was based on $3,000 in constant 1962 prices, whereas Gallaway used 1957–1959 prices and Anderson used 1959 prices. Other papers discussed here, as well as my own analysis, used 1964 constant dollars. The differences represent very little change in real value, because prices were quite stable in this period.

[5] Underlined terms are used throughout the paper to represent national aggregate data.

The model Aaron used is essentially this:

$$P_{it} = f(\underline{M}_t, \underline{U}_t). \tag{2}$$

This is a somewhat disaggregated form of Gallaway's model, in that the dependent variable is the incidence of poverty in the *i*th group rather than in the nation as a whole. The analysis was made for several population groups, varying by location or residence (farm or nonfarm), by race (white or nonwhite), and by sex of family head.

Aaron concluded that Gallaway's rather optimistic view of the curative role of economic growth by itself was unwarranted. For example, among the nonfarm, white, female-headed families, more than 34 percent would still be poor in 1970 and nearly 25 percent in 1980, despite a high economic growth rate. These families accounted for more than a third of all poor households in 1964.

A more incisive treatment of the basic relationships was given by Anderson [2]. Observing both time-series and cross-sectional data, Anderson recognized a consistent relationship between the incidence of poverty and the median income of various population subgroups.[6] Plotting P_{it} (incidence of poverty for subgroup i in year t) on the vertical axis against log M_{it} (the group's median income), Anderson found that the data neatly followed a "poverty curve" having the general slope of an inverted logistic asymptotic to the horizontal (median income) axis. The steep portion of the curve necessarily lies above the poverty cutoff level of median income—in this case $3,000. It can be shown that this relationship must hold as long as nothing is done to change the shape of the typical income distribution. Income transfer programs that bob off the left tail of the distribution by raising everyone to some minimum income level would (happily) destroy this sticky relationship between median income and percentage in poverty.

When time-series or cross-sectional data are selected so that the range of median income is from about $3,000 on up, one would expect the poverty curve to be concave upward, with slope negative but approaching zero, and asymptotic to the median income axis. This is what we found when plotting data for several different breakdowns of the population from 1947 to 1966 [14, 17].

Anderson's analytical model contained two relationships: the poverty curve,

$$P_{it} = f(M_{it}), \tag{3}$$

and the "trickling-down" equation

$$M_{it} = f(\underline{M}_t). \tag{4}$$

In essence, this model recognizes the almost invariate "poverty curve" relation between P_{it} and M_{it} as described above. The model then goes on to recognize that not all groups share proportionately in economic growth. As national median income rises some groups may receive a far greater increase in median income than do less-advantaged groups who are in the so-called "backwash" of the economy. The benefits of rising aggregate demand cannot be counted on to "trickle down" to these latter groups of poor families.

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[6] Anderson used an income below $3,000 in constant 1959 dollars as his definition of poverty.

Anderson used annual time-series data from *Current Population Reports* for years 1947 to 1960 in fitting his "trickling-down" equations. He found several groups to be in the backwash of the economy, by virtue of the fact that their median income failed to rise very much if at all as national median income increased.

Anderson did not link up his two equations so as to relate national median income to group poverty rates. Nor did he make any formal projections though the implications clearly indicated that recent trends are not at all optimistic for some groups of the population. In fact, the only groups whose median incomes closely follow the national median are white and nonwhite families headed by a man under age 65. All other groups—farm families and families headed by women or aged persons—seem to be in varying degrees isolated from economic growth.

Projections Model Used Here

The analysis presented here goes beyond the previous studies in several ways. First, the model used—shown implicitly in the next three equations—is a further disaggregation of the Aaron model, in that group median income and unemployment rates are used to explain group poverty:

$$U_{it} = f(\underline{U_t}), \tag{5}$$

$$M_{it} = f(\underline{M_t}, U_{it}), \quad \text{and} \tag{6}$$

$$P_{it} = f(M_{it}, U_{it}). \tag{7}$$

Second, this model is an extension of the Anderson model in that group unemployment is included as an independent variable and is estimated in a third equation as a function of the national unemployment rate. This feature is desirable because other studies [9, 11] have shown, for example, that certain disadvantaged or backwash groups of the population have much higher unemployment rates and less gain in employment than "advantaged" groups such as white adult males.

Another feature of this model is that a recursive method is used to link the three equations together in projecting poverty rates into the future.[7]

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[7] Two-stage least squares is often prescribed for estimating the parameters of equations in recursive models. This technique was tried at an early stage of this analysis. The results were essentially identical to those obtained using ordinary least squares. Consequently, the latter method was adopted for purposes of the present paper.

First, a given national unemployment rate such as 4 percent is assumed to prevail during the projections period, for example from now to 1975. Then a projected national median income in 1975, $\underline{M}_{75}$, is selected in such a way as to be roughly consistent with the unemployment assumption, $\underline{U}_{75}$. The value of $\underline{U}_{75}$ is substituted into the unemployment regression equation of a given group (5) to determine what unemployment rate the specific group would be likely to have. The resulting group unemployment rate is then plugged into the median income regression equation (6), along with the assumed 1975 national median income, to see what the group's median family income would be in 1975 (in constant 1964 dollars). Then the group's median income and unemployment rate are plugged into the poverty regression equation (7) to project the percentage of families in the given group (that is, whites or nonwhites) having less than \$3,000 income (in 1964 constant dollars) in 1975.

Obviously, this is a gross oversimplification of several highly complex economic phenomena. The model should be viewed not as a structural relationship but simply as a device for analyzing and projecting current trends.

Time-series data from 1948 to 1966 were used to obtain least-squares estimates of the equations for whites and for nonwhites separately [14, 17, 18]. Other breakdowns of the population by color and farm–nonfarm residence were also employed in fitting equations, to provide different sets of projections at the subnation level.

Initially, the log-log equation form was used to estimate each of the equations (5, 6, and 7) in each group's recursive system. Other equation forms were then tested to see how stable the projections are with regard to equation form.

Findings

Using unemployment data for years 1948 to 1966, one equation was fitted for whites,[8]

$$(5.1)\quad \log U_{1t} = \underset{(-1.4)}{-0.0239} + \underset{(39.9)}{0.970}\log U_t \qquad (R^2 = 0.989,\ d = 0.92)$$

and another for nonwhites,

$$(5.2)\quad \log U_{2t} = \underset{(3.2)}{0.171} + \underset{(14.2)}{1.124}\log U_t \qquad (R^2 = 0.922,\ d = 0.87).$$

As shown by these two equations, Nonwhites seem to have a higher elasticity of unemployment than do whites with respect to national unemployment. As $\underline{U}$ increases by 1.0 percent, the unemployment rate for whites rises 0.97 percent compared with 1.12 percent for nonwhites. Ignoring the possibility of autocorrelation,[9] this appears to be a fairly significant difference in elasticities.[10]

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[8] Shown in parentheses below each coefficient is the Student's t statistic for testing the null hypothesis that the coefficient is zero. This is a deliberate departure from orthodox procedure [7, p. 187], which calls for showing in parentheses the standard deviation of the coefficient—thus requiring the reader to divide to get the test statistic.

This fact by itself suggests that nonwhites have proportionately more to lose than do whites from a rising unemployment rate. This conclusion is supported by other analysis. For example, using the first-difference model, $\Delta U_{it}=f(\Delta \underline{U}_t)$, Muth [9] found that nonwhite males had an elasticity of 1.915, compared with 0.979 for white males. A similar difference between whites and nonwhites was found for females.

Mollie Orshansky [10] has shown that the incidence of poverty is lower among multiple-earner families: "Twelve percent of the husband–wife families were poor [in 1965] when the wife did not work and 5 percent even when she did." Although this comparison is not conclusive, because other things are not held constant, a reasonable relationship is indicated. Mooney [8] found that the labor force participation rate for nonwhites in metropolitan areas was more responsive than that of whites to changing unemployment in local labor markets. In effect, his findings suggest that during prosperous times low-income families (particularly nonwhites) often lift themselves out of poverty by becoming multiple-earner families. Conversely, as the local unemployment rate rises by 1 percent, the labor force participation rate of nonwhite married women declines by $4\frac{1}{2}$ percent.

Clearly, more low-income people are likely to get jobs as the labor market goes from slack to tight. And while there is a lower percentage of poverty among the employed than among the unemployed, a job often pays too little. In 1966, for example, 9.5 million persons were poor even though they lived in a family whose breadwinner had a job throughout the year [10, p. 15]. Thus, in analyzing poverty trends we must look not only at employment data but also at the extent to which the incomes of the various groups vary with unemployment and economic growth. This leads to the next equation of the system (6). Equation (6.1) is for whites, and (6.2) is for nonwhites.

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[9] There appears to be positive serial correlation of the residual errors in equations (5.1) and (5.2), since in each case the Durbin–Watson d statistic is slightly below d_L (in this case, 0.96). Muth [9] solved this problem by using first differences in fitting this type of equation. However, the use of first differences carries an implicit, and possibly unwarranted, assumption that the autocorrelation coefficient is 1.0. Furthermore, the resulting first-difference equation is not practical for the projections model used here; so we use (5.1) and (5.2), and accept the chance of some autocorrelation.

[10] When the data for whites and nonwhites are pooled, the slope-shifter (coefficient of $Z\underline{U}_t$) is significant at the 10-percent level:

$$(5.1.2)\ \log U_t = \underset{(4.3)}{0.1710} + \underset{(19.2)}{1.1235} \log \underline{U}_t - \underset{(3.5)}{0.1948}\, Z - \underset{(1.9)}{0.1535}\, Z \log \underline{U}_t \quad (R_o=0.98,\ d=0.89),$$

where $Z=1$ for whites and 0 for nonwhites. Equation (5.1.2) yields equation (5.2) or (5.1) when the dummy variable is set at zero or unity, respectively. This type of equation is discussed briefly by Johnston [4, p. 223].

$$\begin{array}{lll} (6.1) & \log M_{1t} = 0.0146 - 0.002 \log U_{1t} + 1.008 \log \underline{M}_t & (R^2 = 0.999, \\ & \qquad\quad (2.8) \quad (-0.5) \qquad\qquad (153.0) & \quad d = 2.59); \\ (6.2) & \log M_{2t} = -0.272 - 0.088 \log U_{2t} + 1.145 \log \underline{M}_t & (R^2 = 0.976, \\ & \qquad\quad (-8.1) \quad (-3.1) \qquad\qquad (23.9) & \quad d = 2.44). \end{array}$$

(These equations seem free of serial correction, since their respective Durbin–Watson d statistics lie between d_u and $4\text{-}d_u$—in this case, 1.41 to 2.59.)

The white group's elasticity with respect to national median income is, not surprisingly, very close to unity. This is to be expected, since whites constitute 89 percent of the labor force. The elasticity for nonwhites is much higher, 1.145. (In fact, this elasticity is significantly higher, at the 1-percent level, as shown in a test equation analogous to equation (5.1.2), discussed in footnote 10.) This result is consistent with the findings reported by Anderson [2].

In equation (6.1), the elasticity of white median income with respect to white unemployment has the expected sign, but it is essentially zero—probably because M_{1t} and $\underline{M}_t$ are so tightly correlated that $\underline{M}_t$ is picking up all the "action." But for nonwhites, the elasticity is larger, indicating that nonwhite median income is highly responsive to the percentage of the nonwhite labor force unable to get jobs.

Equations (7.1) and (7.2) are the poverty equations for whites and nonwhites, respectively:

$$\begin{array}{lll} (7.1) & \log P_{1t} = 2.297 - 1.383 \log M_{1t} + 0.057 \log U_{1t} & (R^2 = 0.995, \\ & \qquad\quad (122.0) \quad (58.9) \qquad\qquad (3.5) & \quad d = 1.49); \\ (7.2) & \log P_{2t} = 2.187 - 1.042 \log M_{2t} + 0.006 \log U_{2t} & (R^2 = 0.990, \\ & \qquad\quad (123.7) \quad (37.6) \qquad\qquad (0.3) & \quad d = 0.98). \end{array}$$

Equation (7.2) shows that nonwhite unemployment is not significant per se in explaining the variance of the nonwhite poverty rate. Nonwhite median income by itself explains nearly all the variance. But in the context of equation (6.2), we see that the nonwhite unemployment rate has an important indirect effect on nonwhite poverty through its effect on the median income of nonwhite families.

Assumptions Underlying Poverty Projections

Perhaps the weakest link in this model, as with any projections model, is the choice of reasonable and mutually consistent values of the exogenous variables. A basic question here is this: Given an assumed level of unemployment ($\underline{U}$), what rate of economic growth and, consequently, what level of median family income ($\underline{M}$) can we reasonably expect? Three different sources were used to provide alternative assumptions. First, the CEA–

Gallaway assumptions were used. These provide a comparison with the earlier projections, using 4- and 6-percent unemployment rates. Second, a functional relationship between $\underline{U}$ and $\underline{M}$ was estimated to provide pairs of values consistent with past trends. Data for the 1948–1966 period were used to estimate equation (8) ($\underline{M}$ is in thousands of 1964 dollars; $\underline{U}$ is in percent; T is the year: 48, 49, . . . , 66):

$$(8)\quad \log \underline{M} = \underset{(0.2)}{0.00455} + \underset{(36.7)}{0.0134T} - \underset{(2.5)}{0.047 \log \underline{U}} \quad (R^2 = 0.989,\ d = 1.28).$$

In this equation, time (T) is a proxy variable representing economic growth and all other factors except unemployment. In effect, when equation (8) is used, $\underline{M}$ becomes endogenous and $\underline{U}$ becomes the only exogenous variable. The equation implies that rising unemployment is accompanied by a downward deviation from the exponential growth trend. This is obviously an oversimplification, but as a source of mutually compatible $\underline{U}$ and $\underline{M}$ assumptions for the present analysis it has some intuitive appeal. Using equation (8), values of $\underline{M}$ were calculated assuming the 4- and 6-percent levels of unemployment. The resulting values of $\underline{M}$ were higher than those implied by the CEA–Gallaway assumptions, particularly at the 6-percent level of $\underline{U}$. In fact, equation (8) yields values of $\underline{M}$ which seem unrealistically unresponsive to changes in $\underline{U}$: \$9,430 versus \$9,260 at the 4- and 6-percent levels of unemployment in 1975, for example.

The third set of assumptions was derived from a report of the Joint Economic Committee [12]. Only the 3- and 4-percent unemployment rates are given in that report, with projections to 1975. The basic economic assumptions (that is, level of Vietnam war expenditures and price level) have been violated in the past two years. Consequently, the JEC projections of economic growth and the implied median income[11] must be viewed as more or less hypothetical, like the other assumptions presented here.

Series 2 population projections were used in estimating the number of families in 1975 and 1980 [17]. The proportion of families that are nonwhite is assumed to be 11 percent in 1975 and 11.5 percent in 1980 based on past trends [17].

Resulting Projections for Whites and Nonwhites

The projections for white and nonwhite families implied by the foregoing assumptions are shown in Table 1.

These projections show that, if current trends persist, nonwhites will continue to have significantly higher unemployment than whites and that a rise

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[11] For details of the procedure for relating GNP to median income, see an earlier version of this analysis [6]. That paper also used the JEC assumptions. The 1965 income data used in that analysis were subsequently revised by the Census Bureau [14].

Table 1. Projections of unemployment, median family income, and poverty, by color, 1975 and 1980, with 1966 comparisons[a]

Assumptions			Projections to 1975 and 1980									
			U		*M*		*P*			Number of families in poverty		
Source and year	*U*	*M*	White	Non-white	White	Non-white	White	Non-white	Total	White	Non-white	Total
	percent	*thousand dollars*	*percent*		*thousand dollars*		*percent*			*millions*		
To 1975												
CEA–Gallaway	4	9.03	3.6	7.0	9.47	5.59	9.5	25.8	11.3	4.77	1.59	6.36
	6	8.33	5.4	11.1	8.72	4.90	10.9	29.7	13.0	5.46	1.84	7.30
Eq. (8)	4	9.43	3.6	7.0	9.89	5.88	9.0	24.5	10.7	4.49	1.51	6.00
	6	9.26	5.4	11.0	9.70	5.53	9.4	26.2	11.3	4.72	1.62	6.34
JEC	4	9.39	3.6	7.0	9.85	5.85	9.0	24.6	10.7	4.51	1.52	6.03
	3	9.53	2.7	5.1	10.02	6.12	8.7	23.5	10.3	4.35	1.45	5.80
To 1980												
CEA–Gallaway	4	10.40	3.6	7.0	10.91	6.58	7.8	21.8	9.5	4.36	1.54	5.80
	6	9.28	5.4	11.1	9.72	5.55	9.4	26.1	11.3	5.11	1.84	6.95
Eq. (8)	4	11.06	3.6	7.0	11.60	7.05	7.2	20.3	6.7	3.91	1.43	5.34
	6	10.73	5.4	11.1	11.26	6.55	7.7	22.0	9.3	4.17	1.55	5.72
1966 (Actual)	3.8	7.11	3.3	7.3	7.38	4.42	13.3	32.4	15.2	5.85	1.59	7.44

[a] Symbols and terms are defined in the text. These projections are based on 1948–1966 data [13, 14, 18] fitted to log-log regression equations (5.1, 5.2, 6.1, 6.2, 7.1, and 7.2). All income data are in 1964 constant dollars.

in the national unemployment rate from 4 to 6 percent will force the nonwhite unemployment rate up from 7 percent to 11 percent. By 1975, the current $3,000 differential between the median income of white and nonwhite families will widen to $4,000, if the more favorable economic environment (4-percent unemployment and 1947–1956 rate of economic growth) is maintained. By 1980 the gap will be somewhat wider. But if the less favorable economic environment prevails (6-percent unemployment and the slower 1957–1963 rate of growth), both whites and nonwhites will have median incomes several hundred dollars lower. All the assumptions used here give comparable, though somewhat different, results in regard to median income projections.

What do these trends imply with regard to the percentage and absolute number of white and nonwhite families in poverty—lacking enough income to buy the amount of goods and services $3,000 would buy in 1964? Under the 4-percent CEA assumption, we can expect to see the percentage of all U.S. families in poverty decline from its 1966 level of 15 percent to 9.5 percent by 1980. The proportion of white families in poverty would decline from 13 to 8 percent; the nonwhite incidence of poverty would drop from 32 to 22 percent. Slightly lower projections are obtained if we assume the level of median income estimated in equation (8), with 4-percent unemployment. The JEC 4-percent assumption yields projections quite comparable to those of equation (8) for 1975.

In absolute numbers, the poverty projections seem considerably less optimistic. For even though the incidence of poverty is tending downward, the absolute number of nonwhite families in poverty remains nearly constant from 1966 to 1975, and declines only slightly by 1980. And if the less favorable economic environment prevails (6-percent unemployment and 1957–1963 growth rate), the number of nonwhite families in poverty would actually increase above 1966 levels.

Projections by Color and Residence

Projections were also made for the farm and nonfarm breakdown for whites and nonwhites. A slightly abbreviated version of the projections model was used. Equation (5) was deleted, and national unemployment ($\underline{U}$) was used instead of group unemployment in equations (6) and (7). This modification was necessary because unemployment data are not available for this breakdown of the population.

Conclusions of these projections are rather dismal for nonwhite farm families. Between 1966 and 1975 their median income is projected to rise from $1,900 to $3,000, using the 4-percent CEA assumption. Their incidence of poverty would drop from its 1966 level of 75 percent to 68 percent. This group is apparently in what Anderson [2] calls phase 1; they are so far below the poverty level that very few families are pulled over the $3,000 income line even with a $1,100 rise in median income. By 1980 nearly 64 percent of nonwhite farm families are projected to be in poverty, with a $4,000 median income. However, this 1975 to 1980 projection is very weak, because the shape of the poverty curve is known to change from concave downward to concave upward when the median income reaches the poverty line—in this case, $3,000. Therefore, it is not safe to project nonwhite farm poverty beyond 1975, using the poverty equation derived from observations at much lower levels of income.

Nonfarm nonwhites are projected to receive a $1,200 increment in median income between 1966 and 1975, and their incidence of poverty would drop from 31 percent to 22 percent. By 1980, one in five nonwhite nonfarm families would still not be able to afford the goods and services that $3,000 would buy in 1964. Of course, by that time the national standard of living will have risen so much that families at this income level will be in a relatively less favorable economic position than they are in today (Table 2).

Under these same assumptions (4-percent unemployment) white farm and nonfarm families are projected to have a much higher increase in median income—$1,600 and $2,100, respectively, by 1975, and another $1,400 increment by 1980. The incidence of poverty among white farm families is projected to decline from 28 to 17 percent between 1966 and 1980. Nonfarm white poverty would drop from 12.4 to 7.7 percent.

If less favorable economic conditions prevail between now and 1980 (CEA 6-percent unemployment assumption), we could expect to see a substantially higher percentage of farm families left in poverty—4 percentage points higher than the 4-percent unemployment assumption. An even greater difference would be seen among nonwhite nonfarm families. Their incidence of poverty would be 5.8 percentage points higher.

These farm–nonfarm projections are, of course, quite tenuous. Migration patterns and other factors are not treated explicitly. Nonetheless, these projections give some indication of the trends in the structure of poverty, and the importance of favorable economic conditions.

Implications

By now each of us has received at least one pay check that is somewhat smaller because of the tax surcharge. One dubious consolation is that in the next few months an increased number of low-income families will receive no pay check at all. They will lose their jobs because of rising unemployment brought on by the induced reduction in disposable income and aggregate demand. The poor will bear the real burden of the anti-inflationary monetary–fiscal policy, both directly through the labor market and indirectly through inadequate funds for antipoverty programs. How can this injustice be avoided? I suggest a package of programs including guaranteed income for those unable to work, and for the others a combination of guaranteed

Table 2. Projections of median family income and percentage of families under $3000, by farm–nonfarm residence and color[a]

Assumptions			Projections to 1975 and 1980								
			M				*P*				
Source and year	$\underline{U}$	$\underline{M}$	Farm		Nonfarm		Farm		Nonfarm		All U.S. families
			White	Non-white	White	Non-white	White	Non-white	White	Non-white	
	percent	*thousand dollars*	*thousand dollars*				*percent*				
To 1975											
CEA–Gallaway	4	9.03	6.5	3.0	9.6	5.8	21.4	68.3	9.2	22.1	11.3
	6	8.33	5.7	2.6	8.9	4.9	25.0	71.5	10.1	27.8	13.0
Eq (8)	4	9.43	6.9	3.3	10.0	6.0	20.0	66.8	8.7	21.1	10.7
	6	9.26	6.7	3.2	9.9	5.6	21.2	67.8	8.9	24.8	11.3
JEC	4	9.39	6.9	3.3	10.0	6.0	20.2	67.0	8.7	21.2	10.7
	3	9.53	7.1	3.4	10.1	6.5	19.3	66.2	8.6	18.9	10.3
To 1980											
CEA–Gallaway	4	10.40	8.0	4.0	11.0	6.5	17.2	63.6	7.7	19.0	9.5
	6	9.28	6.7	3.2	9.9	5.4	21.2	67.7	8.9	24.8	11.3
Eq (8)	4	11.06	8.7	4.5	11.7	6.9	15.7	61.7	7.1	17.9	6.7
	6	10.73	8.2	4.3	11.4	6.1	16.9	62.9	7.4	21.5	9.3
1966 (Actual)	3.8	7.11	4.9	1.9	7.5	4.6	27.9	75.0	12.4	30.5	15.2

[a] See text for definitions of terms and explanation of assumptions. Projections are based on 1959–1966 data [13, 14, 18] fitted to log-log equations similar to those for Table 1.

employment, job training and placement, and a wage-supplement program. These measures could break the cycle of poverty. But how would these programs affect aggregate demand, growth, and prices? Many questions remain unanswered.

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Discussion: Poverty by Color and Residence—Projections to 1975 and 1980

RICHARD T. CROWDER

The discussant of a paper can follow one of several routes. Having reached similar conclusions using the same or similar procedures, he can

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RICHARD T. CROWDER *is manager of the Economic Analysis Division, Wilson & Co., Inc.*

praise the presenter for a major research effort. He can use the opportunity to present research results of his own which may or may not be directly related to the subject at hand. He can question the objectives, assumptions, methodology, and conclusions of the paper. And, finally, he can raise questions that are not answered to his satisfaction in the paper, which, in turn, can point out areas for future research. Since I have not conducted any research in this area, I cannot use the first alternative. And since presenting research results on other subjects would be an obvious encroachment upon the privileges granted to discuss this paper, I shall devote some comments to the model used and conclusions reached or lack thereof. Primarily, I want to point up a number of questions which are avoided in Dr. Madden's paper but which will require answers before we can make any headway toward eliminating the poverty problem.

Poverty has abounded for ages, but never before has it received the intense attention that it has in recent years. A review of the literature points up this fact. Unfortunately, however, too much attention has been given to describing who is poor and predicting how many will be poor and too little attention to the why's of poverty and the methods of eliminating poverty. Dr. Madden's paper seems to be but another in a series of predicting how many will be poor.

Recognizing some of the deficiencies in previous models, he employs a recursive model to project the incidence of poverty among various population subgroups, with subgroup median income and unemployment rates as explanatory variables. However, this model suffers a deficiency common to previous models: notably, that the incidence of poverty is "explained" by median income. Then, in turn, poverty is measured in terms of median income. But this is a near tautology.

The result is that we, as noted by Dr. Madden, have predictive models and not structural models. Consequently, little, if any, in the way of policy implications can be drawn from the results. This is well illustrated by the absence of any such implications in his paper.

It should not be construed, however, that these predictive efforts have been fruitless. A major contribution of such analyses is that they point out the marked differences in the response of poverty incidence among various subgroups to changing economic conditions. The results here, for example, indicate that with a 4-percent unemployment rate, the number of nonwhite families in poverty will decline at a rate of less than 0.75 percent annually between 1966 and 1975, whereas the number of white families in poverty will decline approximately 3 percent per year. These analyses also give us an indication of the magnitude of the poverty problem. And finally, these analyses suggest that means other than economic growth must be relied upon to alleviate poverty in certain subgroups of poor.

It is here that critical questions have not been addressed and answers are needed. Why the differences in the responses of various subgroups to economic growth? What can or should be done to improve the plight of those subgroups whose poverty incidence rate is unresponsive to economic growth? What can be done to minimize the economic impact on the poor when our economy requires restraint such as it does now? Many answers have been proposed to the above questions. However, none have been substantiated and quantified by good basic research. Even the projections that we have had do not completely substantiate or disprove the "backwash" thesis.

Other more specific questions also need to be addressed. The business fraternity, for example, is well aware of the hard-core unemployment problem and other problems associated with poverty in rural areas, small towns, and central cities. Doubtless, business wants to make a major contribution to these problems. But what form should it take? In this area, business faces a host of complex issues, as is well illustrated by Garrity [1]. Many of these issues, as noted by Garrity, are intangible and difficult to quantify. However, many others, such as costs, labor turnover, and labor productivity, can be quantified and analyzed. The government needs an evaluation of alternative programs such as tax credits for business and the negative income tax. In these areas, research can make an important real-world contribution.

Our key challenges are to test adequately the "backwash" thesis, to isolate the influence of key variables affecting the poverty incidence rate among various subgroups of poor, and to recommend appropriate policies and action by government and business for a more substantial alleviation, if not elimination, of poverty.

These challenges will not be discharged with any small amount of effort. As pointed out by Thurow, "the various possible explanatory variables are so closely related to each other that a wide variety of variables could be used to do an equally good job of explaining poverty" [2, pp. 42–43]. Consequently, the limits of our economic logic and statistical expertise will be tested.

Dr. Madden, in his implications, has noted that a dubious consolation of our smaller pay checks as a result of the income tax surcharge is that in the next few months an increased number of low-income families will receive no pay check at all. It must appear even more dubious to these low-income families that to date all we have done is to project a slowly declining incidence of poverty for them. Predictions do give us an indication of the magnitude of the task we face. This we need to be aware of. However, high R^2's are not solutions and predictions are not prescriptions. We now need more research focused on prescriptions and less on predictions.

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CONTRIBUTED PAPERS: PROBLEMS IN HUMAN RESOURCE DEVELOPMENT

CHAIRMAN: DAVID W. FISCHER, UNIVERSITY OF RHODE ISLAND

Drawing a Poverty Line for Government Services: An Initial Attempt*

THOMAS F. STINSON

INCREASED national concern with poverty has resulted in many special programs to aid areas and groups with a high incidence of poverty. It appears, however, that in our haste to attack this problem we have focused on only a portion of its scope. Consequently, we may have less than complete success in eliminating poverty.

Specifically, the nation has accepted a definition of poverty which is too narrow. Our present definition was devised by determining the income necessary to provide a family command over a minimum adequate amount of privately produced goods and services. This definition has at least two major failings. First, no allowance is made for building a stock of assets to be used in old age. That is, no provision is made for insuring command over the same minimum adequate amount of goods and services after retirement.

The second and, I would argue, the more serious defect in our present definition is that publicly provided goods and services, such as education, are not included in this minimum market basket of goods. This is a major omission, for adequate levels of public goods may be more important than adequate income in solving the poverty problem in the long run. For example, children in a family below the income poverty line with access to adequate schools and health facilities appear to be more likely to become economically self-sufficient than the children in a family with income slightly above the poverty line residing in an area with substandard school and health facilities.

The objective of this paper is to discuss ways in which minimum adequate levels of public services might be defined. In addition, the paper presents the results of one attempt to draw a poverty line for government services.

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* The views expressed here are my own and do not necessarily represent those of the Economic Development Division, Economic Research Service, or U.S. Department of Agriculture.

THOMAS F. STINSON *is regional economist with the Economic Research Service, USDA.*

Procedure

Any attempt to measure government output faces two major problems, neither of which has a completely satisfactory solution. First, no standard output measure for public services exists. There are no units such as tons, and, more important, there are no quality standards such as U.S. Grade A, against which service levels can be compared. Consequently, it is extremely difficult to make meaningful comparisons between levels of government services in different localities. In dealing with this problem, students of public finance typically assume that equal per capita expenditures produce an equal quantity and quality of public services. In this study, minimum service levels were computed using this assumption. They were also computed using a new assumption, that equal per capita man-years devoted to a service produces an equal quantity and quality of service.

The second problem is that there are differences between states in the unit of government responsible for providing public services. Some states provide all of such services as highways and welfare, while others require local governments to assume responsibility for these services. Further, in some areas the county is the chief unit of local government whereas in other areas it is the city or the township. Finally, certain services may be provided by the private sector instead of the public sector. All of these make it difficult to compare the total amount of services available for each individual.

This problem was minimized in two ways. First, the county area was used as the unit of analysis and all local governments within the county were treated as one. Second, where differences in the level of government providing a service caused major problems—specifically health and hospitals, highways, and public welfare—the services were treated separately and netted out of the totals.

Minimum adequate service levels can be determined in several ways. It is possible to define a county as being below a government services poverty line if it falls in the lowest quartile or decile of the counties when they are ranked by per capita expenditure or full-time-equivalent employees per capita devoted to the service. Or an arbitrary percentage below the national mean level of service could be selected as a minimum service level. Neither of these approaches is satisfying, however. A standard so constructed depends almost entirely on the initial assumption of the researcher. Further, it is, by definition, impossible to improve matters. The lowest quartile will always contain 25 percent of the counties.

A poverty line can also be constructed by specifying in physical terms the contents of an adequate market basket of government services. These physical inputs can then be costed and the per capita cost of the market basket computed. There are, however, major problems with this approach. Little agreement exists among the experts on what constitutes an adequate level of service. The debate over educational quality alone is sufficient to illustrate this disagreement. Further, both the cost and the contents of this package will vary across the nation, making it extremely difficult to make national comparisons. Consequently, this approach, although useful in theory, was also rejected.

The approach used in this study was based on the assumption that citizens in a democracy have a knowledge of the adequacy of their government services, given their budget restraints, and that citizens through the political process have some control over the level of services provided. If these assumptions hold, then in general local governments will provide what is considered by the public as adequate levels of public services, provided that their budget constraint is not such that it forces the service level below that which citizens with average income feel they require.

With this assumption it becomes relatively simple to determine minimum service standards. What must be done is to identify a group, or several groups, of counties which would be expected to have adequate service levels, and to determine a minimum standard for each service from the preferences of the study group. A partial check on the validity of this approach can be obtained by comparing the minimum standards found for each sample group. If the standards found are similar, it is likely that some accepted minimum level for public services exists.

The sample groups of counties were identified in the following way. Studies of determinants of public expenditures suggest that total population, median family income, and percentage increase in population all influence local expenditures. Consequently, all counties in the nation were ranked on each of these three criteria and divided into decile groups. The mean per capita expenditure was found for each decile. In each array at least four distinct groups of counties appeared, each with means significantly different from the others at the 5-percent level and with insignificant differences between decile means within each group. In each case the two middle groups were selected as study groups, and 10-percent samples were drawn from these groups. Samples from counties not containing a large central city in Standard Metropolitan Statistical Areas, and counties adjacent to SMSA's were also drawn. For each sample the mean and the standard deviation were calculated both for per capita expenditure and for full-time employment per ten thousand people, for a number of services.

The minimum standard for each service was then arbitrarily established as the mean service level minus one standard deviation. It was felt that the use of this figure could only be criticized as giving too low an estimate of the minimum adequate standard.

Findings

Detailed results of the study are presented in Tables 1 and 2. The major findings of the study were these: (1) In general the estimates of the minimum adequate service levels, despite their rather arbitrary nature, were found to be relatively consistent and independent of the characteristics of the sample group the estimate was based on. This consistency suggests that the estimates are less subject to the criticism of being arbitrary than would be those obtained through the methodologies discussed earlier. In addition, it was noted that if the sample groups are divided into two groups on the basis of the expected minimum level of ser-

Table 1. Minimum adequate service standard for county areas, by characteristics of sample group

Characteristics of counties	Current expenditures[a]	Education	Police	Fire	Sewage disposal	Sanitation	Park and recreation
	dollars per capita						
2nd decile, total population	78.53	53.74	3.52	2.17	0.39	0.89	0.15
2nd and 3rd deciles, percentage increase in population	93.09	59.70	3.82	1.87	.71	0.32	0.43
3rd decile, median family income	100.59	70.69	3.93	1.33	.58	—[d]	—[d]
SMSA counties[b]	79.78	66.80	3.85	1.25	.82	0.37	0.59
3rd–8th deciles, total population	74.14	51.81	2.00	0.39	.09	0.04	—[d]
4th–9th deciles, percentage increase in population	77.95	57.78	2.35	0.04	.08	—[d]	—[d]
4th–7th deciles, median family income	78.65	60.91	2.53	0.55	.37	—[d]	0.68
Adjacent counties[c]	81.62	60.69	2.71	0.69	0.23	0.15	—[d]

[a] Excludes health and hospitals, highways, and public welfare.
[b] Counties in an SMSA not containing a large central city.
[c] Counties adjoining an SMSA.
[d] Mean minus standard deviation less than zero.
Source: Computed from *Census of Governments, 1962*, Vol. IV, No. 4, *Compendium of Government Finances*.

Table 2. Minimum adequate service standard for county areas, by characteristics of sample group

Characteristics of counties	Total employees[a]	Education	Teachers	Non-education	Police	Fire	Other[b]
	employees per 10,000 residents						
2nd decile, total population	143.3	99.6	73.9	35.8	6.7	3.3	10.7
2nd and 3rd deciles, percentage increase in population	161.2	90.9	67.8	37.4	6.3	2.6	—[e]
3rd decile, median family income	196.9	120.0	90.9	37.2	6.6	1.9	8.5
SMSA counties[c]	158.2	115.0	82.7	36.3	6.8	1.5	8.5
3rd–8th deciles, total population	143.0	106.9	83.5	26.1	4.3	0.5	2.3
4th–9th deciles, percentage increase in population	155.7	112.5	83.6	24.5	4.9	—[e]	4.5
4th–7th deciles, median family income	154.6	111.6	84.2	30.6	5.5	—[e]	7.3
Adjacent counties[d]	145.4	103.3	79.8	33.2	5.6	1.25	8.1

[a] Excludes health, hospitals, and highways.
[b] Excludes general control and financial administration.
[c] Counties in an SMSA not containing a large central city.
[d] Counties adjoining an SMSA.
[e] Mean minus standard deviation less than zero.
Source: Computed from *Census of Governments, 1962*, Vol. III, *Compendium of Public Employment*.

vices, as is done in the upper and lower halves of Tables 1 and 2, two sets of standards, each with less internal variation, are obtained. These findings appear to reinforce the assumption that a minimum accepted level of services exists. (2) For some services, such as fire protection and sewage disposal, the minimum adequate levels found appeared to be too low. In these cases, the variation about the mean appeared to be too great to allow the use of the mean minus one standard deviation as a minimum. (3) For some services, notably for education, the use of full-time-equivalent employees per ten thousand population produced more consistent estimates than did per capita expenditures. In most other instances, the minimum standards found were slightly less consistent than those based on per capita expenditures.

Conclusion

It appears that an indication of what the public considers to be an adequate level of public services can be obtained through the methodology used in this study. The minimum standards found are open to question on several grounds, however. The most important difficulty is the assumption that the public is able to assess adequately the level of service and influence changes in it. It may be that the public systematically undervalues public goods, in which case these estimates will be too low. Nonetheless, the estimates obtained in this study do provide a starting point for future attempts at measuring public services.

Further research, both in refining indicators of minimum service standards (especially for those services such as fire protection, where this technique produced inadequate results) and in identifying regions which lack adequate public services, is necessary. It appears especially important for those concerned with rural poverty to begin looking at public service poverty. It is likely that public service poverty is relatively high in rural areas and that it may be one of the causes of long-term income poverty in rural areas.

Implications of Negative Tax Plans as Antipoverty Measures in Low-Income Regions*

LLOYD D. BENDER AND BERNAL L. GREEN

VARIOUS income maintenance plans based upon negative taxation have been proposed as measures to counter poverty [4]. Most persons are familiar with positive taxes, those taxes based upon adjusted income multiplied by the appropriate tax rate—adjusted income being, of course, total income less exemptions and standard deductions. A negative tax would be based upon the same formula, but it would apply only when adjusted income is less than zero. This means that a negative tax liability would be incurred by the government when exemptions and deductions for a tax unit exceed total income. Using exemptions and standard deductions ($200 plus exemptions times $100), the government would incur a negative tax liability should a family's income fall below $900 for the first exemption plus $700 for each additional exemption. The amount of the transfer payment from the government to the tax unit would depend, not only upon the negative difference between total income and exemptions plus deductions, but also on the tax rate applicable. Thus, a 75-percent negative tax rate would mean that the government's liability would be increased $750 per $1,000 income *decrease*, or that an individual tax unit could keep $250 of each $1,000 earned income *increase* if the unit were in a negative tax bracket.

The objectives of negative tax plans generally are (*a*) to treat poverty more effectively, (*b*) to offer a substitute for present welfare assistance, and (*c*) to create work incentives. As a result of research on which this paper is based, the plans as presently constructed appear inadequate on all counts.

Milton Friedman lists objectives *b* and *c* among advantages of his negative tax plan. He states that the negative tax "reduces the incentive of those helped to help themselves but does not eliminate that incentive entirely, as . . . supplementing incomes up to some fixed minimum would" [2, p. 192]. He believes, however, that a rate above 50 percent would have serious effects upon work incentives. Yet a 50-percent rate with presently defined exemptions and standard deductions yields a schedule of

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* This paper was prepared in cooperation with the Missouri and Arkansas Agricultural Experiment Stations. Cooperation with the Office of Economic Opportunity is also acknowledged. Data are from a sample of 1,413 households in the rural portions of the Ozarks Region of Arkansas, Missouri, and Oklahoma.

LLOYD D. BENDER *is an agricultural economist with the Economic Research Services, stationed at the University of Missouri.* BERNAL L. GREEN *is an agricultural economist with the Economic Research Service, stationed at the University of Arkansas.*

maximum government transfer payments (assuming no income) of $450 for one exemption, plus $350 for each additional exemption.[1] These payments would be less than present levels of welfare payments in most states and would fail to raise low-income families above a poverty level. Furthermore, work incentives would be greater *only* for those previously on welfare assistance, where a dollar earned reduces welfare payments by a dollar. Thus, those presently on welfare who could qualify for negative tax payments as provided in the Friedman plan would have more favorable work incentives, but work disincentives would remain even at a 50-percent tax rate. Disincentives would clearly result in the case of those who are not now on welfare but who could qualify for negative tax payments, for these tax units would move from a near-zero tax on income to a high tax of perhaps 50 percent over a range of additional earned income.

Data from a sample of 1,413 households in the rural portions of the Ozarks Region (1965) indicate that a large proportion would be given work disincentives under the Friedman plan. While only 285 received welfare payments, 686 would have qualified for negative tax payments. Thus, most of those qualifying for Friedman payments were not previously on welfare.

These data also indicate that the income gap (based on a target income of $3,000 per annum) remaining if the Friedman plan were operative would be less than that in the present welfare system. But it is not sufficiently less to qualify the plan as a relief for poverty. More importantly, 168 of the 285 sample welfare recipient households would receive less disposable income under the Friedman plan than under the present welfare plan. Thus, in the rural Ozarks, negative taxation as espoused by Friedman would not be a substitute for the present welfare system nor a successful program to alleviate poverty.

A Work Incentive Plan

We have formulated a plan which attempts to select various favorable features of negative taxation and to recombine them into a mechanism which could (*a*) partially treat poverty, (*b*) substitute for some public welfare, and (*c*) create incentives to obtain better jobs and skills. The work incentive plan considered in the remaining paragraphs involves a direct subsidy on earned incomes in conjunction with a plan for public assistance. The public assistance level of income support is assumed to be a minimum level which would be guaranteed, although the level could be varied. The plan involves the three essential components of negative taxation: a break-even level of income, a welfare guarantee, and a subsidy rate. The main difference from the Friedman plan is that the government's liability increases as income increases, rather than increasing as income decreases. Labor productivity is frankly subsidized to strengthen work incentives.

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[1] Minimum welfare guarantee equals the tax rate multiplied by maximum negative tax incomes.

Using selected assumptions,[2] the work incentive plan is illustrated as follows: A family of four with no earned income would receive a "welfare" subsidy of $1,500, as indicated in Figure 1. A family with an earned income of $500 would receive an income subsidy of $100 and a welfare subsidy of $900, a disposable income of $1,500. Families earning less than $1,250 would be as well off not working. Their condition would be equivalent to that of families now receiving welfare except that their eligibility would not be categorical. The implied marginal tax rate on earned income of less than $1,250 is 100 percent. Stated differently, the incentive to earn another dollar is zero at levels below the $1,250 family income. However, a clear incentive remains to change to a job paying more than $1,250 annually.

Families earning between $1,250 and $2,500 would receive an income subsidy, but the welfare subsidy would be zero. These family members would have positive marginal incentives to work longer hours at their present jobs, and an added incentive to change jobs and improve skills to attain a higher wage rate and higher total subsidy.

Families earning $2,500 to $3,000 would be taxed at an "implied rate" of 100 percent. Every dollar earned above $2,500 would result in a reduced income subsidy rate in order that earned income and subsidy would not exceed $3,000. A disincentive to work an additional hour at the same job exists. However, the incentive to change jobs, perhaps by moving from the region to areas with higher wage rates, is again operative.

This work incentive plan has more flexibility than the Friedman plan.[3] For example, the earned income subsidy feature could be initiated without changing the present welfare assistance program. Or the noncategorical minimum welfare feature could be used in conjunction with the

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[2] $Y = A + bA' + Z$,
subject to the constraints that
$b = 0$ when $A' \geq \$3{,}000$,
$b = 0.2$ when $A' \leq \$2{,}500$,
$b < 0.2$ when $\$2{,}500 > A' < \$3{,}000$,
$Z \geq 0$, and
$Z = \$1{,}500 - (A + bA')$,
where
Y is disposable income (earned & subsidy),
A is earned income & social security,
A' is earned income excluding social security,
b is earned income subsidy, and
Z is the amount paid on minimum welfare guarantee.

[3] If the Friedman plan is used in conjunction with break-even income levels associated with the existing tax rules, selection of a minimum welfare guarantee determines the tax rate, and vice versa.

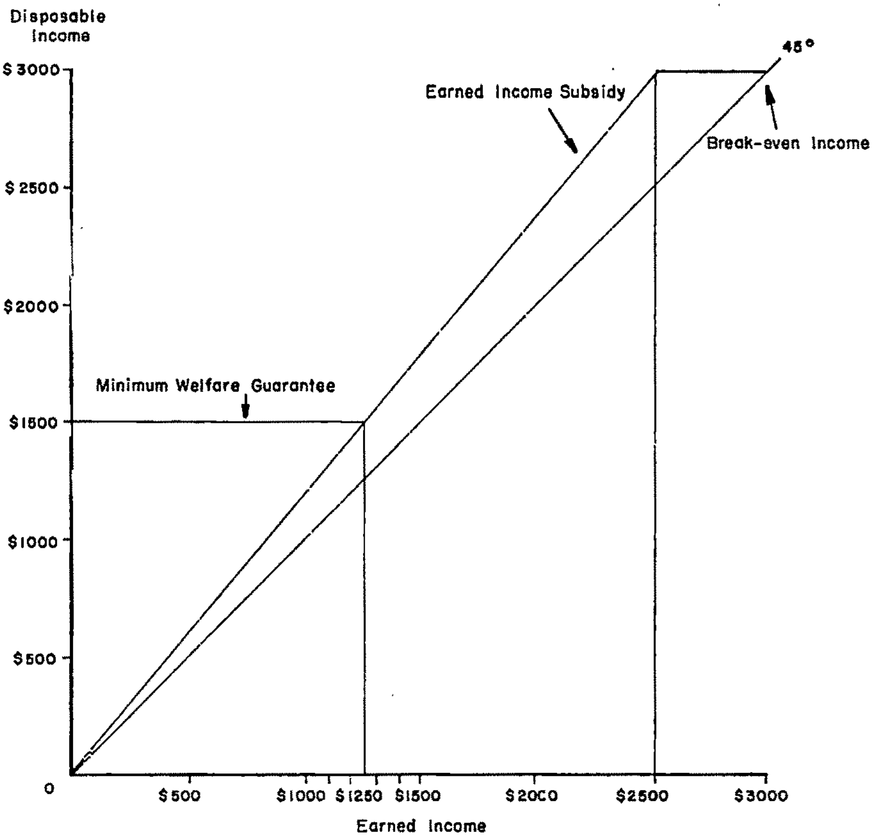

Figure 1. Work incentive plan

earned income subsidy. Also, the minimum welfare guarantee, the earned income subsidy rate, and/or the break-even level of income could be changed independently. The additional flexibility, compared with that of the Friedman Plan and the existing welfare plan, allows adaptation in order to treat changing conditions or to meet varying regional needs.

Comparison of the Plan

Of the 1,413 households in the sample, 695 would qualify for payments under the work incentive plan (Table 1). This may be compared with 686 who would qualify under the Friedman plan, and with 285 who were receiving welfare payments during 1965 [1]. Total payments under the work incentive plan would be $463,505, compared with $661,283 under the Friedman plan at the 50-percent rate, and $329,886 paid in 1965 under the present welfare plan. The income gap (based on a target income of $3,000 per year) remaining under the three plans would be $771,637, $636,946, and $823,530, respectively.

Table 1. Work incentive plan: number of recipient households, amounts of payments, and income gap remaining, by household class, rural Ozarks Region sample, 1965

Household class	Sample households	Income subsidy		Welfare subsidy[a]		Total subsidy	Income gap remaining[b]
		Recipient households	Payments	Recipient households	Payments		
	number	*number*	*dollars*	*number*	*dollars*	*dollars*	*dollars*
Single-member households							
Heads ≤24 years old	1	1	180	0	0	180	1,284
Heads 25 to 54 years old	20	12	1,370	8	10,979	12,349	16,200
Heads ≥55 years old	188	178	7,247	153	157,650	164,897	244,994
Subtotal	209	191	8,797	161	168,629	177,426	262,478
Multiple-member households							
Heads ≤24 years old	51	16	4,176	2	1,800	5,976	5,698
Heads 25 to 54 years old	612	134	26,047	56	57,186	83,233	109,937
Heads ≥55 years old	541	354	36,483	199	160,387	196,870	393,524
Subtotal	1,204	504	66,706	257	219,373	286,079	509,159
Total	1,413	695	75,503	418	388,002	463,505	771,637

[a] Households would receive a welfare subsidy if their earned income plus subsidy were less than $1,500 for 1965. At levels above $1,500, the welfare subsidy is zero. This is based on a subsidy rate of 20 percent.

[b] The gap is based on $3,000 minus (earned income plus social security plus subsidy payments).

Summary and Conclusions

There are variations in the effectiveness of plans based upon negative taxation to meet specified goals. Data presented in this paper indicate the need for constructing and evaluating several such plans before a way can be charted toward achievement of the specified goals dealing with poverty. Also, the need is great to formulate and test alternative plans for welfare and negative taxation. Alternatives should certainly consider the causes of structural welfare dependency, and effective measures to deal with it. The total set of problems may require measures such as family allowances, massive dissemination of birth control knowledge, greatly increased levels of social services, particularly to households headed by women, and curtailment of the freedom of male household heads to abandon their families [3, pp. 9–10].

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Push–Pull and Schooling Investment

FRED HINES AND LUTHER TWEETEN

UNITED STATES census data for 1960 are used in this study to reexamine the push–pull theories of migration. One contention is that the aphorism "last hired and first fired" applies to the least educated among regions as well as over the course of time. Those with least education are most influenced by depressed economic conditions within a region, and these individuals are *pushed* by declining job opportunities from depressed regions to more prosperous regions.[1] Using the farm example, it is the full renter, sharecropper, and hired farm laborer who are least educated and have the least economic "bargaining power"; hence, they are most likely to be pushed to employment elsewhere. Support for the push theory would be apparent in high migration rates among regions for the least educated.

Another contention is that the most educated are best fitted by skills and attitudes for successful employment and assimilation into more prosperous regions. These individuals would be *pulled* from a slow-growing region to more lucrative jobs elsewhere. This theory would be supported by high migration of the most educated among regions.

Migration means a flow, not only of people, but also of capital through education embodied in migrants. The investment in education of migrants entails a major capital cost, some of which will be lost to the region of origin as the recipients use this investment to generate income streams in other regions.

The net movement of people may be from regions with less ability to pay for education to regions with more ability to pay for education. Another proposition is that socioeconomic factors tend to select for out-migration those individuals whose future income streams are greatest—the young and most educated. If so, this would compound the disassociation of the incidence of the benefits and costs of education.

To create proper incentives for a desirable investment in education, there is merit in maintaining a reasonable balance between benefits and costs for the local, state, and federal publics investing in schooling. For example, a low local benefit–cost ratio, because of out-migration of the young and most educated, can lead to serious underinvestment in schools

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[1] The nine regions referred to in this paper correspond with the U.S. Census Division and are outlined in Figure 1

FRED HINES *is an agricultural economist, ERS, USDA, stationed at Oklahoma State University.* LUTHER TWEETEN *is professor of agricultural economics at Oklahoma State University.*

by the local community. This might call for a realignment of costs among local, state, and federal sources.

On the other hand, if it is found that the push theory is dominant, and the least educated leave the depressed regions, a case also might be made for realignment of support for education, but on different grounds. The least educated often bring with them well-known social problems—unemployment, ghettos, and crime. In this case, more prosperous regions may be willing to see funds from their areas used to raise the quality of education in depressed regions, either to slow the rate of out-migration from the latter or to raise the quality of migrating human capital.

Hypotheses

To resolve some of these issues, the following hypotheses are tested in this paper:

(*a*) That migration rates increase with education: the most educated categories have higher migration rates than the least educated categories within given age brackets.

(*b*) That regions with low income per student (total personal income in the region divided by the number of students) enrolled in public primary and secondary schools will experience net out-migration, whereas regions with high income per student will experience net in-migration.

(*c*) That migration patterns compound the disparity in income among regions by selecting for migration a disproportionate share of the persons with the greatest future income stream from regions having the lowest income per pupil enrolled in primary and secondary schools. The corollary is that the regions having a high income per pupil enrolled (representing a high ability to invest in education) will experience disproportionate in-migration of persons with the greatest future income streams (the young and educated).

Migration Patterns

Mobility is greater among young than among old adults (Table 1). For persons with four years of high school in 1960, 12.4 percent of those 25–29 years of age lived outside of the region of their 1955 residence. But only 3.6 percent of those 50–54 years of age lived outside their 1955 region of residence in 1960.

The data support the pull theory but do not lend any support to the push theory. Within a given age bracket, migration rates tend to be lowest among those with least education. Rates rise for those with a high school education and are even higher for those with a college education. A curve illustrating the distribution of migration rates across education levels would be lowest at one to four years of education and, in general, would increase at an increasing rate across education levels for each of

Table 1. Percentage of United States population 25–64 years of age living outside region of 1955 residence in 1960, by age and educational attainment

Age	Educational attainment							Total
	Elementary			High school		College		
	1–4	5–7	8	1–3	4	1–3	4 or more	
	percent							
25–29 years	5.8	8.1	9.9	10.6	12.4	19.1	27.6	13.8
30–34 years	4.7	5.9	6.7	7.1	7.9	11.9	18.2	8.8
35–39 years	3.8	4.4	4.9	5.4	6.6	10.1	13.5	6.9
40–44 years	3.0	3.3	3.6	4.1	5.2	8.1	10.4	5.1
45–49 years	2.5	2.6	2.9	3.4	4.2	5.8	7.5	3.8
50–54 years	2.2	2.3	2.6	3.0	3.7	4.6	5.9	3.2
55–59 years	2.0	2.1	2.5	3.1	3.6	4.1	5.0	2.9
60–64 years	1.8	2.9	2.7	3.3	4.0	4.2	4.9	3.1
Total	2.8	3.5	3.8	5.3	6.8	9.6	13.7	6.2

Source: Data from U. S. Department of Commerce, Bureau of the Census, *Census of Population, 1960,* Subject Report, *Lifetime and Recent Migration,* PC(2)2P, Table 8.

the age categories. This curve would be steeper for the younger age brackets. The highest migration rates of all are found among individuals who are both young and highly educated. This suggests that the potential is large for redistributing benefits to other regions and away from the region where investment in schooling occurred.

We must look to regional data to resolve further this issue (regions defined in Figure 1). To condense the migration data on age, education, and region into manageable proportions, the age–education categories are expressed as "productivity classes" (Table 2). These productivity classes are based on the present value of remaining lifetime earnings. Productivity Class I, comprised of 25–29-year-olds with four or more years of college, has the greatest future earning stream; Productivity Class VII, comprised of 55–59-year-olds with one to four years of schooling, has the lowest future earning stream. The ability to finance education is measured by personal income per student enrolled in elementary and secondary school in 1955. The simple interregional correlation between ability to finance education and total net migration is 0.012. It obviously is not significantly different from zero at any reasonable probability level.

While there is little association between our measure of ability to support schooling and total net migration rates, the pattern of migration among productivity classes is consistent with hypothesis *c,* that rates of out-migration are highest among the most productive groups from regions with least ability to pay for education (Table 2). The rate of in-migration

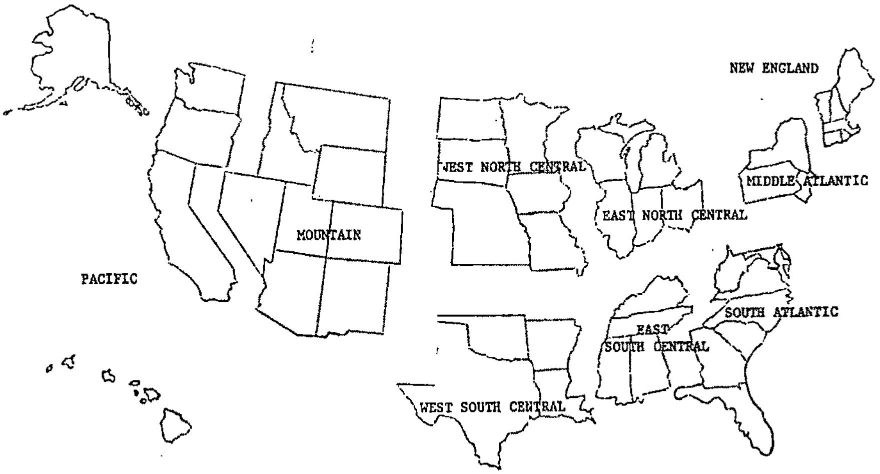

Figure 1. Regions of the United States

is also highest among the most productive groups to regions with the most ability to pay.

In Productivity Class I, the Pacific Region, with an income per student of $11,417, had the highest net in-migration rate, 23.8. The East South Central Region, with an income per student of $5,300, had the highest net out-migration rate, 13.07, in the same productivity class.

The South Atlantic Region, with a personal income per student of only $7,107, displayed net in-migration over all education–age categories, but had a net out-migration rate of 1.31 in Productivity Class I. The reverse is true for the East North Central Region. This region, with $11,869 per student, ranks high in ability to support education. It experienced a net out-migration rate of 1.20. But of considerable interest is the net in-migration rate of 0.61 in Productivity Class I.

Other results conflict with the above conclusions. For example, the New England Region, with a high ability to support education, experienced a considerable out-migration in Productivity Class I.

Federal aid to education can help to compensate for the exodus of capital embodied in educated people. Table 2 indicates, however, that federal aid to education bears no consistent relationship to the ability of regions to support education, or to rates of migration.

Conclusions

Data support the pull theory but fail to support the push theory of migration. Migration rates are sizable for the most educated and are lowest for the least educated for any age-class.

The young most-educated group exhibits the greatest mobility of all.

Table 2. Net migration for census regions, ranked by personal income per student enrolled in elementary and secondary schools, by potential productivity class, United States, 1955–1960[a]

Region	Personal income per student enrolled in elementary and secondary school, 1955	Potential productivity class								Percentage of school revenue from federal sources, 1965
		I 25–29 yrs. of age, 4 or more yrs. of college	II 30–34 yrs. of age, 1–3 yrs. of college	III 35–39 yrs. of age, 4 yrs. of high school	IV 40–44 yrs. of age, 1–3 yrs. of high school	V 45–49 yrs. of age, 8 yrs. of schooling	VI 50–54 yrs. of age, 5–7 yrs. of schooling	VII 55–59 yrs. of age, 1–4 yrs. of schooling	Total	
	dollars	*proportion of 1960 population in specified category who were net immigrants between 1955 and 1960*								*percent*
Middle Atlantic	13,984	− 0.29	−3.51	−2.16	−1.30	−0.93	−0.48	−0.64	−1.44	5.8
New England	12,852	− 7.62	−0.19	−1.06	−1.05	−0.70	−0.30	−0.24	−0.97	8.0
East North Central	11,869	0.61	−2.83	−2.15	−1.49	−0.64	−0.37	0.03	−1.20	10.4
Pacific	11,417	23.77	7.95	6.01	5.47	4.86	4.21	3.70	6.07	6.8
West North Central	8,707	− 8.88	−5.36	−3.29	−2.96	−1.50	−1.32	−0.39	−2.86	5.8
Mountain	7,921	5.92	7.80	7.44	4.99	4.62	1.72	1.07	5.05	10.0
West South Central	7,190	− 8.25	−1.53	−0.23	−0.45	−0.80	−0.46	−0.82	−1.31	8.9
South Atlantic	7,107	− 1.31	2.79	3.19	2.48	2.48	0.56	0.41	1.98	7.5
East South Central	5,300	−13.07	−2.62	−1.37	−1.55	−1.64	−1.22	−1.10	−2.36	14.8

[a] Migration rates from same sources as Table 1. Personal income per student enrolled in elementary and secondary schools from U. S. Department of Commerce, Bureau of the Census, *Statistical Abstract of the United States, 1957,* Table 371, and *1956,* Table 135. Distribution of school revenue for 1965 from National Education Association, Research Division, *Estimates of School Statistics, 1965-66,* Research Report 1965–R17.

When these people move, they carry with them a substantial investment of public funds in education and substantial future earning power. Hence, their movement among regions represents a large realignment of benefits and costs of education.

There is evidence that regions which educate persons at greatest sacrifice tend to have a heavy outflow of persons with the highest potential future earning ability created through the investment in education. Results are sometimes conflicting, however, and measures of the total dollar volume of capital flows among regions through education is a useful focus for future research.

In short, of the three hypotheses presented in this paper, the first is supported, the second is not supported, and the third is generally supported, but with some notable exceptions.

Developing Estimates of Economic Underemployment for the Rural Labor Force of Seven Southern States

THOMAS T. WILLIAMS AND ROBERT B. GLASGOW

FOR most underdeveloped countries, underemployment is widely recognized as a more significant problem indicator than unemployment. Less appreciated is the fact that underemployment is also a significant indicator of relative economic health for geographic areas and economic activity sectors of highly developed economies, such as that of the United States.

Among the rural persons in the states to which this study is applicable, unemployment is generally less severe than the national average, but incomes of the rural population of these states are and long have been among the lowest in the country. The study on which this paper is based was, in part, undertaken to test an hypothesis that economic underemployment is a significant factor contributing to relatively low incomes among southern rural people.

Aside from some limited data concerning "visible underemployment" or "partial unemployment," that is, those persons involuntarily working only part time, there have been few attempts to quantify underemployment in the United States. It seems probable that visible underemployment bears to total underemployment a relationship similar to that between the visible part of an iceberg and the whole. This absence of quantitative data concerning the principal dimensions of economic underemployment has, therefore, tended to render it a nonfunctional concept for broad program and policy evaluation in this country, despite its obvious relevance and honorable, if limited, place in economic and manpower utilization theory.

Economic underemployment when quantified, however, permits additional and more exacting judgment of an economy's performance with respect to both efficiency and equity criteria than does the use of conventionally defined unemployment data alone.

In general, farming and rural areas either have become declining employers of labor or have—while keeping pace in population growth—failed to grow in levels of employment at rates approximating the national average. Economic sectors or geographic areas having these characteristics may be expected to be repositories of underemployment of the nonvisible type.

The general purposes of the study on which this paper is based are (1)

THOMAS T. WILLIAMS *is professor of agricultural economics at Southern University and A&M College.* ROBERT B. GLASGOW *is an economist with the Economic Research Service, USDA.*

to develop a technique for measuring underemployment for small geographic areas in quantitative terms from available secondary data, (2) to discern significant socioeconomic conditions with which underemployment appears to be functionally associated, and (3) to examine policy and program implications of the location and extent of underemployment.

The small geographic areas studied were the 92 state economic areas (SEA's) comprising the states of Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, and South Carolina. For both the farm and the rural nonfarm labor forces of these areas, estimates of what we term the man-equivalent years of economically unutilized labor resulting from economic underemployment have been made for whites and nonwhites of both sexes.

The concept of involuntary economic underemployment used here may be formally defined as the man-equivalent years of economically unutilized manpower among employed civilians that exists in a specified group as a result of failure to utilize manpower of the group as effectively as labor of comparable income-earning capacities and economically relevant values and tastes is utilized in the U.S. economy as a whole.

An arbitrary adjustment was also made, that is, an adjustment not related to the relative income-earning capacities of the study populations. This was a downward adjustment equal to 85 percent of the median income required to reflect earnings equivalent to those obtaining in the U.S. as a whole for labor of comparable income-earning capacity.

This downward adjustment is rationalized by considering that areas where major adjustments in labor utilization are needed require a wage differential between them and the economy at large in order to encourage local investment that will provide alternate employment opportunities and to encourage geographic mobility of labor.

Procedure

For each residence–color–sex group of each state economic area, separate adjustments were developed for the effect upon median income of (1) level of educational attainment, (2) labor-force participation rate, (3) age structure, (4) employment status, and (5) civilian or military status. Each of these adjustments is a percentage of the median money income of the relevant sex group in the United States as a whole. Each percentage is a proportion of the median money income of the corresponding group of the norm which would, with respect to that one factor, represent equivalent income for persons of comparable income-earning capacity.

When the five adjustment factors relating to income-earning capacity were developed, a product of the percentages was obtained ($1 \times 2 \times 3 \times 4 \times 5$). This product percentage was taken as an estimate of the combined effect of all adjustment factors. It represents our estimate of the percentage of the median money income of the relevant sex group of the norm which would give each study population a median money income equivalent to that obtaining in the norm for labor of comparable income-earning capacity.

The next step is to multiply the median income of the relevant sex group of the norm by the product percentage of the adjustment factors. The product thus obtained was considered the "required median income" for a particular residence–color–sex group. It is that median income which would indicate that the population under consideration receives for labor services a reward equivalent to that received by labor of comparable income-earning capacities and tastes in the United States as a whole.

The median income actually obtaining for the residence–color–sex group of an SEA is then expressed as a percentage of this "required or national counterpart median." The resultant relative number is our estimate of the index of economic utilization of manpower for the study population cell. An index of 100 or more indicates that manpower of that cell is economically utilized as effectively as or more effectively than comparable manpower in the U.S. as a whole. An index of less than 100, on the other hand, indicates the extent to which manpower of the cell under consideration is economically unutilized. The difference between 100 and any index number may, therefore, be considered as the estimated percentage of economic utilization of manpower for a particular residence–sex–color cell.

Since the basic populations which we have analyzed are those persons in each cell who have income, the economically unutilized manpower would be found in three groups among those having income. These are the employed, the unemployed, and those with income who are not in the labor force. It is our position that annual average unemployment percentages of the labor force best indicate, for any cell, the man-equivalents of unused manpower resulting from unemployment. For various reasons we abstain from applying our estimated percentages of economic utilization to those proportions of study cell populations that have income but are not in the labor force.

The estimated man-equivalent years of economically unused manpower that we develop are, therefore, derived by applying the relevant percentage of economic utilization to the number of employed civilians in a given residence–sex–color cell.

The number thus derived, when expressed as a percentage of the relevant civilian labor force, may reasonably be taken as the percentage of the civilian labor force which is economically unutilized as a result of economic underemployment among employed civilians. From the standpoint of evaluating the effectiveness of manpower utilization, these estimates

Table 1. Estimates of economically utilized labor among employed rural civilians resulting from economic underemployment, by color–sex groups, seven southern states, 1960

Residential group and measurement basis	Total			White			Nonwhite		
	Both sexes	Male	Female	Both sexes	Male	Female[a]	Both sexes	Male	Female
Total rural									
Full equivalence of median income									
Percentage of civilian labor force	23.1	30.2	5.6	17.9	24.8	—	37.4	46.1	19.2
Number	800,432	743,340	57,092	454,751	454,751	—	345,681	288,589	57,092
15 percent less than full equivalence									
Percentage of civilian labor force	15.3	20.1	3.6	10.1	14.0	—	29.7	37.8	12.4
Number	531,268	494,318	36,950	257,244	257,244	—	274,024	237,074	36,950
Rural nonfarm									
Full equivalence of median income									
Percentage of civilian labor force	17.1	22.1	6.1	12.2	17.4	—	32.3	38.1	21.7
Number	424,263	377,378	46,885	228,543	228,543	—	195,720	148,835	46,885
15 percent less than full equivalence									
Percentage of civilian labor force	9.3	11.6	4.1	4.6	6.5	—	23.7	28.8	14.6
Number	229,567	197,956	31,611	85,536	85,536	—	144,031	112,420	31,611
Rural farm									
Full equivalence of median income									
Percentage of civilian labor force	37.8	48.5	4.2	33.3	43.7	—	47.2	59.3	12.5
Number	376,169	365,962	10,207	226,208	226,208	—	149,961	139,754	10,207
15 percent less than full equivalence									
Percentage of civilian labor force	30.3	39.3	2.2	25.3	25.3	—	41.0	52.9	6.5
Number	301,701	296,362	5,339	171,708	171,708	—	129,993	124,654	5,339

[a] Manpower utilized as effectively as or more effectively than comparable manpower in United States as a whole.

are logically analogous and supplemental to estimates of average annual unemployment as conventionally defined.

Some summary results of this study are presented in Table 1. The principal implications of these data appear to be the following:

(1) Economic underemployment appears to be a significant cause of relatively low incomes for all rural males and for rural Negro women.

(2) The rural areas of these seven states have, among persons now employed, latent manpower equivalent to 800,000 man-years of labor available to employers who can provide incomes equivalent to those earned by comparable persons in the national economy. There would be approximately 530,000 man-years of such labor available to employers who could pay at rates that would provide incomes equivalent to 85 percent of those earned by persons of comparable capacity in the United States as a whole.

(3) These estimates are based on 1960 Census of Population data; but comparable, or more sophisticated, estimates could be developed currently from household surveys of adequate size and detail. Such data should be quite valuable in planning programs for economic development and in determining the size and characteristics of the latent labor force in rural areas.

REDIRECTING MARKET RESEARCH

Chairman: Joseph Pursell, University of Georgia

Changing Orientations of Marketing Research

James Duncan Shaffer*

> There is no point in whistling in the dark and trying to comfort ourselves with the notion that somehow we shall muddle through. For the revolutionary forces that are loose in the modern age are greater than our conventional wisdom.
>
> —Walter Lippmann

MORE than anything else, this essay is a search for a more meaningful professional role for the publicly supported agricultural economist in a radically changing and troubled America. My efforts were initially directed to this topic by a very general question, "What should we be doing in marketing research?" asked by the administrators of the Economic Research Service. They tied the question to an offer of support, providing an opportunity to discuss marketing research with a number of producers and users of such research. In response, I wrote *A Working Paper Concerning Publicly Supported Economic Research in Agricultural Marketing*, which was printed by ERS. This essay is an elaboration of several themes from this working paper.[1]

The task is to identify the important emerging problems and issues which relate to the economic and social organization of the food and fiber sector and then to identify the researchable questions which, when aggregated and interpreted, contribute to the understanding of the larger issues [6].

Scientific Industrialization

Relevance of future research depends upon a capacity to anticipate problems. To do this, we need to understand better the dynamics of our economy. Simplifying a complex phenomenon, let me briefly identify what seem to me to be several salient aspects of our emerging economy. The dominating characteristic of the evolving economy is a process which I have called "scientific industrialization" [15]. This process involves the specialization of work in the production and distribution of (1) consumer

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[*] I want to thank the many people who have been willing to discuss marketing research with me and to react to my manuscripts. I regret that I am unable to transmit all of their insights in this paper.

[1] I have also made liberal use of material in a paper which I presented at the Seminar Toward Better Economic Research on the Food and Fiber Industry, held in Lincoln, Nebraska, in May 1968 [16]. The seminar produced a number of excellent papers relevant to this discussion.

James Duncan Shaffer *is professor of agricultural economics at Michigan State University.*

goods, (2) capital goods, and (3) scientific and technical knowledge. The newly created capital goods and techniques are substituted for existing skills, labor, and equipment in particular economic activities. Existing skills and equipment are made obsolete, or reduced in value. The incentive for investing in a new technology is the promise of reward from increased productivity. The increased productivity and obsolescence alter the level and distribution of incomes, wages, and relative prices. The process also produces changes in the preferences, beliefs, values, and institutions of the community. And these changes alter the pattern of economic incentives and constraints.

I suggest that we are in a period of radical transformation which started roughly around 1950. It is in this period that we have learned to exploit the combination of science and industrialization. Thus arises the concept of scientific industrialization. The emphasis on specialization in the production and distribution of knowledge—including education, research, publishing, broadcasting, information control systems, and data processing of all kinds—is perhaps the most distinguishing characteristic of our period. The public support for scientific education, research, and development represents the institutionalization of the promotion of economic change. Some have referred to it as the cybernetic age.

Marschak refers to the information revolution and estimates that the knowledge industry may account for 40 percent of the GNP [13]. Educational expenditures have increased more than three times since 1950 [21, p. 44] and a large portion is publicly financed. Investments in research and development, as well as they can be measured, have increased even more rapidly. Indications are that from 1950 to 1964 total expenditures for scientific research and development increased from less than $3 billion to about $20 billion [21, p. 48]. And about three-fourths of this currently is financed by government.

These aggregate data give only a hint of the magnitude of the information revolution. Power and wealth in the society are shifting from those who own land and capital to those who control knowledge. Apparently significant economies of scale exist in private information production, affecting firm size. There are definite economies of scale in advertising which affect market structure. And advertising is involved importantly in other aspects of economic organization, as well as being a major factor influencing beliefs and values.

Changes in the Food and Fiber Sector

Let me mention only a few of the changes in the food and fiber sector associated with scientific industrialization. Specialization is changing the nature and location of work. In general, there is a transfer of work from farms to specialized nonfarm firms. Nonfarm sources of energy are substituted for those produced on the farm. Specialized services, such as feed manufacturing, are substituted for farm labor. New inputs—often carrying new knowledge, such as new seeds, fertilizers, and pesticides—substitute for farm-originating inputs. The trend is toward specialization in animal production, separating it from traditional farming. This is most highly developed in the factory-like operations of poultry and beef finishing. Through changes in technology, chemical and physical characteristics of many low-cost agricultural and nonagricultural raw materials can be manipulated to replace previous production activities of farmers and processors.

From 1950 to 1967 the number of hours worked on farms was reduced by one-half and the total number of farm workers dropped from slightly less than 10 million to slightly more than 5 million. Based upon a straight-line projection, which is of course no basis for predicting, the last hour of farm work would be performed in 1984. At the same time, employment has increased in other phases of the food and fiber sector. Employment in farm supply industries apparently increased by slightly more than 2 million; employment in nonfarm processing and distribution increased by somewhat less than 2 million. Thus, employment was transferred and restructured within the sector, as well as releasing workers to other sectors. As a percentage of the labor force, employment in food and fiber declined from about 40 percent to about 30 percent from 1950 to 1966 [1, p. 22].

The period 1950–1984 may very probably see a tripling of the real GNP in the United States. No community has ever experienced such absolute changes in economic opportunity. The change is significantly altering personal incomes, labor costs, relative prices, and attitudes. Of major significance for the organization of the food and fiber sector are (1) the reinforcing pattern of relationships, stimulating higher levels of specifications in food products, (2) changes in scale economies, and (3) changes in attitudes underlying the rationale for existing economic institutions.

Associated with industrialization is a trend toward larger average size of enterprise at all points in the food sector. A large part of business in farm supply, processing, and retailing is done by large-scale firms. Each of these firms has large long-term investments. Their costs per unit of output tend to decrease with increased volume. They have a high incentive to reduce or control risk and uncertainty. They are large enough that demand for their products is not independent of the action of their competitors. Retailers and food manufacturers attempt to reduce uncertainty and expand markets through advertising and promotion of branded products. At the same time, higher consumer incomes increase the potential for profitable advertising. Successful advertising requires products of highly consistent specifications available in large quantities at specified times. All of these factors combine to increase greatly the need for, and payoff from, a new and higher level of coordination in the food sector.

Scientific industrialization is producing a changing pattern of beliefs and attitudes related to established economic institutions. Let me list several of the many interrelated factors which seem to be involved in the process:

1. Specialization and interdependence go hand in hand. Industrialization, so far at least, has created a system where the individual is highly dependent and vulnerable at the same time as our control over nature expands.
2. The quickening pace of technological change threatens large numbers of people with a change in economic role. Total jobs may expand but the economic positions of many people are threatened.
3. Rapid increases in productivity result in increased absolute discrepancies among incomes of people of similar backgrounds. Groups in strategic positions capture from the system high rewards which other groups do not consider legitimate.
4. The legitimacy of the system of economic rewards is further questioned by those left out, as they observe increasing incomes for less work and the expansion of employment in complex organizations where individual contributions are difficult to evaluate. And it is clear that much increased income does not originate with the efforts of the individual but is a product of the community.
5. Advertising and television combine to widen the gulf between the level of aspirations and the level of living for large groups of people. More specifically, commercial television creates the illusion that every man *must* provide himself and family with the good life, American style, in order to achieve a sense of worth. The result is a high level of frustration and dissatisfaction.

Especially threatened by the changing beliefs and attitudes are the established ground rules for determining the division of increased productivity and the established work roles. All kinds of groups, including teachers, insurance agents, welfare recipients, wives on alimony, and almost all of the participants in the labor force of the food sector, are seeking methods to apply pressure (1) to get a larger share of the bigger pie, and (2) to get a more important voice in determining their relationship to the economic system and to each other. The institutions surrounding income distribution are coming unstuck and becoming obsolete.

Concerns of Participants in the Food and Fiber Sector

As I talked to participants in the food and fiber sector, their concerns centered on changes in relationships in the system. They were concerned with innovation and adjustments to innovation, with contracts and vertical integration, with labor union actions and farmer collective bargaining, with hamstringing regulations and the effects of taxation. They were particularly concerned about the problems which involve the dynamics of the system.

"The Great American Frustration"

But it is the poet Archibald MacLeish who puts his finger on a more fundamental aspect of the scientific industrialization of the American society. He talks of "The Great American Frustration," which he identifies as "a numb, unformed, persistent sense, like the hinting pinch of a pain which is not yet brutal hurt but will be, that we, as Americans, we perhaps as members of our generation on earth, have somehow lost control of the management of our human affairs, of the direction of our lives, of what our ancestors would have called our destiny" [12, p. 13]. He argues that scientific process is being confused with human purpose and that the basic question is not where science and technology are taking us but how we can manage science and technology so that they will be used to help us achieve our purposes.

Our society seems to have a mountain climber's mentality about science and technology. If it is there to be found out, it must be discovered. If the technology is available, it must be tried because it is there. For example, if it is possible to build the supersonic transport, it must be built, never mind the noise and disruption it will bring with it. If we have the technology to replace 800,000 workers on cotton farms, then use it, in the name of progress, efficiency, and private profit. Never mind that the flood of unacclimated rural people to the urban centers will eventually alter the quality of life in the whole nation. The industrialization process is producing serious bads as well as goods and we are failing to control it.

The list of these examples could be expanded by the hundreds. Why aren't we doing more about it? Is it that we don't care? Is it an escape from the freedom to choose what we are to become as a community? Is it a problem of political power and insensitivity of our political institutions? Or is it that we don't understand?

I believe that, as a people, we do care—but I am not sure that we care enough or that those with political power are sensitive to the needs. Among social scientists there is a special problem. As individuals, the social scientists whom I know care about the undesirable side effects of the sicientific industrialization of the society. But scientific respectability requires objectivity, detachment, noninvolvement. The result is that the research is not perceived as a necessary input to effective reform. I believe this is an escape from responsibility.

But I believe that it is more fundamentally a lack of understanding. We do not understand the dynamics of scientific industrialization. We have not understood the flow of consequences from our policies or lack thereof. We have not understood the extent and implications of external effects for organizing economic activity. Such understanding is our research task.

New Definitions of Role in Agricultural Economics

I believe that little is to be gained by debates over the boundaries of the various areas of agricultural economics. I assume that agricultural economics is an applied field of social science and is concerned with problem-solving rather than the application of the abstract principles of economics. I take the role of the agricultural social scientist specializing in marketing to be to understand, to evaluate, and to make recommendations to improve the performance of the dynamic system of markets and related institutions which organize the economic activity of the food and fiber sector.[2] Effective control of the dynamic system requires an understanding of the interactions of alternative institutions and the potential technology in terms of the flow of consequences from the interaction. The gains to be achieved through public research designed to improve static allocative efficiency are usually trivial compared with the potential gains from a better understanding and control of the process of scientific industrialization [9, 11, 14].

By institutions I mean the more or less formalized relationships among members of a community. Of special interest are the rules of the market —the laws, regulations, customs, and standard operating procedures which facilitate or prohibit particular forms of conduct, structure, or exchange. By performance I mean the total flow of consequences from economic activity of the sector which directly affect the well-being of the participants. Restated, the research objective is to predict the effect of expected or possible changes in the organization of the food and fiber sector on a variety of aspects of the well-being of the members of the community.[3]

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[2] The change in orientation which I am suggesting is not newly recognized. For example, the North Central Regional Committee on the Economics of Marketing has for some years concentrated on the broad problems of market organization. The conference on Structural Changes in Commercial Agriculture [19] was in the same spirit, as are a number of other recent activities.

[3] The traditional definition of agricultural marketing as what happens to farm products from the farm gate to the consumer is, in my opinion, inappropriate. The food and fiber sector of an industrialized economy must be understood as a system of interrelated activities. The problems of coordination center on the vertical sequence of activities from the development of inputs for farm input manufacturers to the consumers and the incentive system controlling it. Farming fits into the system by performing several of the many specialized activities in the vertical sequence for a particular set of products. The profession should insist on a modification of the definition as it is being applied in research administration. If I understand Dr. T. C. Byerly, administrator of the Cooperative State Research Service (based upon discussion at the Nebraska seminar, May 24, 1968), he would welcome support for changing the definition of marketing, which now retstricts the use of special funds.

Of course this definition of role overlaps the role of many of the traditional applied areas of agricultural economics. For most of them—public policy, land economics, credit, and aspects of farm management, as well as marketing—have been concerned with the organization and performance of some aspect of the sector. But these traditional divisions no longer make sense in terms of the problems of a dynamic industrialized sector.[4] It is also true that the role goes beyond traditional economics. Rather than avoid the issues and problems because of the limits imposed by the definition of our discipline, perhaps we should seek a new label. Would, perhaps, *human symbiotics* be appropriate? The emphasis would be on understanding organizations of activity which are mutually beneficial [5, pp. 213ff.]. Or perhaps we should return to political economy.

Desirability of a Systems Orientation

We are only beginning to understand the dynamics of socioeconomic systems in the process of scientific industrialization. In order to predict the outcome of the process and all the potential modifications with perfect accuracy, perfect knowledge would be required, clearly an unrealistic expectation. I am not arguing for that kind of perfection. But I would argue for a systems orientation. By this I do not mean formal mathematical systems modeling and formal simulation. Such modeling may be a useful tool and should be used along with other tools where appropriate. By a systems orientation I simply mean the analysis of problems in the context of the broader system, an analysis which takes into account feedback, sequences, and externalities. Attention would be focused on the changing structure of the system of incentives as related to performance. The notion is essentially that of a dynamic cost-benefit analysis, taking into account more than the immediate effects and applying it to the broader range of problems in economic organization. The analysis would include the idea of simulation in the sense of projecting the flow of consequences from an expected or potential modification in the system. This is, of course, what applied social science has always been about. I am only suggesting a shift of emphasis to a set of relationships different from those which we commonly include in our research. I want to put emphasis on the changing relationships of technology, preferences, and institutions, the very things which are taken as given in analysis of static allocative efficiency.

Understanding the dynamics of the sector as a system is of great importance to both public and private decisions. Especially important is the kind of information needed by firms for planning, which is essentially related to the dynamics of the system.

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[4] Dale Hathaway made much the same point in a seminar paper [8].

Needed Programs of Research

I believe that we need programs of research to examine systematically and contrast the performance of what is with what might be in the way of organizing the food and fiber sector. The objective would be to understand the sector as a dynamic system, to assess what it is becoming, and, most importantly, to understand the consequences of many of the alternative ways of instituting, organizing, and operating various parts of the system in order that more intelligent choices can be made among the alternatives in public and private decisions. I suggest two related orientations: (1) issues or institutions, and (2) subsectors or industries.

Issues or institutions

Let me comment briefly on research which is oriented to issues and institutions. Publicly financed research, it seems to me, has a special obligation to evaluate the rules of the market and the economic actions of government. I have argued that in the process of scientific industrialization particular institutions become obsolete or a need for new institutions is created. The effectiveness of existing coordinating institutions is eroded and the acceptance of the institutions related to income distribution and working relationships is undermined. The community can best direct the process of development by leaving most immediate economic decisions in private hands. However, the framework of rules governing transactions involves public decisions. A certain class of activity, of course, requires public enterprise. Here, too, a properly instituted set of rules will allow private choices to enter into the decision process. A critical input to the process of development is the creation of knowledge leading to the reformation of economic institutions.

A number of critical issues involve externality problems. New externality problems are created in the process of scientific industrialization. Many of the "bads" associated with growth are due to external effects. Pollution is an example of a class of congestion problems caused by external effects. It is sometimes argued that the existence of these problems represents a failure of the market [4]. Frequently, however, they represent a failure of government, and perhaps of social science, to identify property rights and other market rules which require decision-makers to take into consideration those consequences of their acts which will direct activity toward the community interest. Almost all economic activity in an industrialized society has an effect—negative or positive—which does not enter the profit or utility account of the actor. Clearly, rules which would internalize all effects would be impossible, and any attempt to make such rules would stifle all economic activity. The problem is to determine the rules by which the effects are assessed and the relationship between the market rules and performance.[5] This changes with technology and magnitude of the effects. For example, the external effects associated with the adoption of innovations causing temporary unemployment of a few hundred people qualified for other employment is very different from innovations causing unemployment of 800,000 workers on cotton farms who are ill-prepared for other employment. Another example involves the use of fertilizers and pesticides. Killing a fly with a swatter has no external effect that I know of. But extensive use of commerical pesticides may affect the environment of large numbers of people. And the cumulative effects of large applications of pesticides and fertilizers may initiate irreversible processes in the ecological system, with intolerable consequences. Another type of externality problem is the costs imposed upon third parties in the process of settling disputes in collective bargaining.

The "free rider" represents another class of externality problems. This is involved in advertising by commodity groups. If a producer benefits from the advertising, should he be required to contribute? The same issue is involved in collective bargaining, marketing orders, and marketing boards.

Least understood is the phenomenon of dynamic externalities. It appears possible that the cumulative effect of sequential decisions involving costs external to the decision-makers can produce market results inconsistent with the preferences of all participants.

I have emphasized externalities because they are involved in problems which are going to make a great deal of difference to our community and because the problems are often not considered marketing problems. These problems are especially relevant for public research, since there is no incentive for the private firm to do such research. And this was not the case with much of the marketing research done in the past.

Let me now list a number of topics which are suggestive of important areas to be researched:

1. Development of social accounts to evaluate performance better.
2. Problems of technological unemployment.
3. Evaluation of rules for collective bargaining by farmers, farm labor, small retailers and processors, and the alternatives of marketing orders and boards.
4. Techniques to improve coordination by better information systems in atomistic markets, including grades and new types of central markets.
5. Evaluation of rules related to vertical integration, including rules for cooperatives.
6. Relationship of rules, which regulate conduct and structure, to performance.

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[5] I appreciate discussions with A. Allan Schmid on this point.

7. Consequences of substituting a graduated guaranteed income for most of the existing income transfer programs in the food and fiber sector.
8. Relationship of market rules to patterns of living.
9. Effects of changing technology and concentration in the sector, including consideration of the family-sized farm.

Subsectors or industries

The second orientation of a program of research is the subsector or industry. The sector must be divided into meaningful units for investigation. Let me introduce a hopefully useful distinction. We have referred to the firms which produce a common product or service as an *industry.* Thus, peach canners would be an industry. When we are concerned with horizontal integration, we are concerned with an industry. I want to put emphasis on the vertical relationships, for these are critical in considering coordination and performance. I should like to call the vertical set of activities in the production and distribution of a closely related set of commodities a *subsector.* The definitions of both *industry* and *subsectors* must be arbitrary and will vary with the research problem. For example, the subsector including hogs–pork would include consideration of the vertical relationships in the production and transfer of inputs in hog feed production, hog production, pork production, and pork distribution. I believe that the problems in an industrializing economy can better be understood by emphasizing the vertical sequences. However, some economy in research may be gained by studies of industries which cut across many subsectors of an economy, as in the case of retailing and transportation.

In these studies I see the approach as diagnostic and prescriptive—that is, clinical. The objective would be to identify the means to improved performance in a systems sense. I see the results of these studies as a major input to the process of scientific industrialization. Emphasis would be on the barriers to improved performance and their removal through reform and education. We need to be able to understand and predict the flow of consequences from new technology and changes in economic organization to assist both private and public decision-makers. To do this, we need studies at the level of the subsector and industry. I believe that task forces should be instituted for these studies.[6]

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[6] I see the New England milk study by R. Bressler and colleagues [3] as an early example of a limited but meaningful subsector study. Several states in the South are developing a subsector study involving rice. The Southern Marketing Research Committee [18] suggested coordinated regional research which would be addressed to some of the same problems I suggest. They do seem to limit marketing to activity beyond the farm gate, which eliminates consideration of many coordination problems for a subsector. Also see papers by Paul Farris [7] and George Brandow [2] in the *Proceedings* of the Nebraska conference. A paper by Burt Sundquist and Ken Farrell given at the same conference [20] discusses problems and opportunities for combining production economics and marketing research.

Need for Coordinated Research

Because the research deals with a complex, changing system and must contrast the consequences of a variety of alternatives within a short period of time in order to be relevant, coordinated programs of research are needed. Many of the significant problems and issues of the food sector are beyond the capacity of a single researcher. Specialists are required to deal with different phases of the problems. Just as specialization in our economy requires coordination, so it is with research specialization. We need creative new rules for facilitating communication and exchange among scholars just as among firms.

Without coordinating research resources, adopting a systems orientation will be to little avail. A number of beautiful project statements are on the books, proposing, for example, to evaluate the system of marketing livestock in the United States. However, the project resources are usually limited to a fraction of a professional man-year per annum. Hildreth reported that in 1966 there were about 740 USDA–Experiment Station projects identified with marketing economics and about 366 man-years devoted to these projects [10]. If these resources could have been combined in several programs of coordinated research and integrated with research in production economics and policy concerned with the commercial food and fiber sector, I believe that considerably more progress could have been made in understanding the system.

I believe that a variety of institutions can be devised to improve the coordination and thus the performance of our research effort. Let me suggest several possibilities.

I suggest that the Economic Research Service establish units or desks with responsibility for collecting, maintaining, coordinating, and integrating data and research findings for specific subsectors, industries, or functions. They should be so good that no research would be undertaken in the problem area without consulting the relevant desk.

I suggest that we develop administrative procedures to facilitate the formation of interstate and interagency consortiums. The key to the consortium would be commitment by professionals from the states and ERS. I would hope that resources could be combined to make major concerted efforts possible in selected areas of research. Perhaps this could be combined with a program of postdoctoral fellowships, where young professionals would have an opportunity to work with a task force including several senior researchers. They would be fully committed to the consortium. I would see this as a means of organizing major subsector studies. It is an alternative to regional research, which now does not have the capacity to organize significant task forces of committed professionals with acceptable consistency.

I suggest that we experiment with professional commissions to prepare position papers representing the best the profession has to offer, based on available knowledge on some of the major policy issues.

The *Journal* and the annual meeting of the Association might be more effectively utilized to coordinate research. Major commissioned articles in the *Journal* could be used to stimulate the integration of existing research and to identify needed research in particular areas. Major portions of annual meetings could be devoted to exploring status and needs for research in well-defined areas.

I believe that an attempt at formal systems modeling of the food and fiber sector would be worthwhile. The initial effort would be useful primarily as a tool in organizing our knowledge of the sector and in identifying some critical research needs. It would tie in with the activities of subsector desks. Perhaps the model would eventually be an effective tool in studying the consequences of particular changes in technology and market rules.

In the process of scientific industrialization, forces are released which can greatly enhance or degrade the quality of life. The institutions to control the process do not develop automatically. I believe that the process can be directed to improved ends and that applied social research by agricultural economists can make a significant contribution.

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Discussion: Changing Orientations of Marketing Research*

LLOYD C. HALVORSON

I am convinced that the contribution by Professor Shaffer in this paper and in his earlier working paper on the same subject will go down as an important milestone in our profession. The future usefulness of and respect for our profession may depend upon how well we implement the philosophic, conceptual, and organizational reorientations which he suggests.

In spite of my high appraisal of Dr. Shaffer's paper I do have some critical views on it. Not only does his paper fail to provide an adequate treatment of the subdiscipline or subfield known as *marketing* but also in my

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* The views expressed in this paper are my own and do not necessarily represent those of the agency.

LLOYD C. HALVORSON *is agricultural economist with the Cooperative State Research Service, USDA.*

opinion he has distorted its definition as well. He might even be faulted a little for not explicitly recognizing farmers as the clientele group that is supposed to be the special beneficiary of much of the funded marketing research in our profession.

It is unfortunate that the topic assigned to Dr. Shaffer by ERS and by this program committee was just *marketing*. His assigned topic might better have been "The Implication of the Scientific Industrialization of American Agriculture for Needed Reorientation in Agricultural Economics." Maybe he should have had even a broader topic, one he suggests himself, "Human Symbiotics." I would suggest that he has written on the structure and organization of agriculture and its social implications.

On his first page Dr. Shaffer writes, "The task is to identify the important emerging problems and issues which relate to the economic and social organization of the food and fiber sector and then to identify the researchable questions . . . ." To me this is more than marketing. Later he writes, "I take the role of the agricultural social scientist specializing in marketing to be to understand, to evaluate, and to make recommendations to improve the performance of the dynamic system of markets and related institutions which organize the economic activity of the food and fiber sector." As I interpret this, Dr. Shaffer would include all studies of forces and institutions that organize the food and fiber sector as marketing. Really, however, I believe that Dr. Shaffer would abolish marketing as a subfield and as a unit of research organization. He continues, "Restated, the research objective is to predict the effect of expected or possible change in the organization of the food and fiber sector on a variety of aspects of the well-being of members of the community." Dr. Shaffer makes a significant admission when he says, "Of course this definition of role overlaps the role of many of the traditional applied areas of agricultural economics. For most of them—public policy, land economics, credit, and aspects of farm management, as well as marketing—have been concerned with the organization and performance of some aspects of the sector. But these traditional divisions no longer make sense in terms of the problems of a dynamic industrialization sector. It is also true that the role goes beyond traditional economics."

I believe that Dr. Shaffer has stretched the definition of marketing completely out of shape in order to cover what he wanted to say about the scientific industrialization of agriculture and social control of the process. From his working paper one could get the impression that he thinks that the riots in our cities come under marketing. I would prefer to see his concerns under the heading, "Structure and Organization of Agriculture."

Dr. Shaffer recognizes his own distortions to a degree. He says, "Rather than avoid the issues and problems because of the limits imposed by the definition of our discipline, perhaps we should seek a new label. Would, perhaps *human symbiotics* be appropriate?" I hope that Dr. Shaffer is given credit for fathering a new subdiscipline or subfield in agricultural economics, "human symbiotics," and that it will not be called "marketing" or even be included in its entirety under the label of *marketing*.

If the subsector studies that Dr. Shaffer recommends cut across the traditional areas of agricultural economics, let us not call all such research "marketing" simply because marketing money may be available, or simply because any federal definition of *marketing* must be assaulted.

Let me say that no matter how we subcategorize our discipline we should never expect to find broad socioeconomic problems that fall wholly within one of the subcategories, or even just within agricultural economics. This does not mean that the subcategories should be abolished or one broadened to engulf all the others. What it does call for is interdisciplinary and intersubdisciplinary approaches and even administrative organization changes. It would favor the occasional restructuring of research agencies, along problem area lines that fit emerging problems. Problem area organization would call for a combination of subdiscipline talent, not a restructuring of the discipline.

I would suggest that in considering reorientations in marketing research we not neglect our traditional framework. Many of our traditional concerns in marketing are still with us and will continue to be with us. We must still be concerned with marketing as the exchange of ownership, with price-making, with how farmers can sell advantageously what they produce, with how to improve markets as a medium of communications between producers and consumers, with market news, with market structure, conduct, and performance, with pricing efficiency, with product promotion, with foreign trade, with reducing cost of marketing processes and functions, with grades and standards, with supply control, with farmer bargaining power, with farm programs, and so on.

I have the uneasy feeling that Dr. Shaffer and I have both failed to maintain a distinction between marketing as a science on the one hand and marketing as a certain set of real-world problems on the other. Has Dr. Shaffer really come up with something new in how we look at marketing from the standpoint of our scientific framework? Or has he just come up with some additional real-world problems that he would include under the heading of *marketing*, maybe just a wholesale broadening of the definition?

If you are wondering whether CSRS would accept all studies falling under Dr. Shaffer's new definition of marketing as eligible for Hatch marketing money, I would say "no," but I would add that very likely many of them would qualify. Even if we in CSRS would accept Dr. Shaffer's definition of marketing, personally, there is still the fact that the law has its own definition. We have recently adjusted our interpretation of the Hatch marketing requirements to include some of the input markets. Maybe we should ask Congress to change the definition, or to earmark money for "human symbiotics" instead.

Now for some odds and ends comments. It is interesting to note that Dr. Shaffer finds it necessary to take on Professor Galbraith in his working paper. It is easy to see why. He writes, "There is, of course, more to Galbraith's thesis. Most important for our purposes is the argument that the market has lost significance as a disciplining and allocative device in the highly industrialized sector of the economy." Again he writes, "It is hard to believe that Galbraith is serious when he argues that the corporation can insulate itself from the market or that the market becomes irrelevant." Apparently, the market becomes nearly irrelevant to Galbraith in a highly industrialized economy, but Dr. Shaffer has made it all-important. This he has done by making marketing everything that organizes economic activity.

Dr. Shaffer spent much time defining scientific industrialization and the control of the process. He might well have spent more time outlining, as Galbraith indicates, why the open market is inadequate in an industrialized economy, what the firms do to supplement the market by all kinds of administrative, organizational, and contractual arrangements, how the market becomes susceptible to administrative control, and what the implications are to farmers. He might have been more explicit as to why production–marketing coordination is so important in an industrialized agriculture and how it is achieved and can be achieved better. He might have been concerned with the economic position of farmers in an industrialized agriculture and what marketing strategies they need to develop with the aid of agricultural economists.

I would have liked to see a more comprehensive and systematic approach to the whole field of marketing conceptually and organizationally. Could we not profit from far more effort along the lines of thought initiated by the Southern Marketing Research Committee in 1963 when they developed their *Framework for Marketing Research in the South?* We need to set forth more specifically the kinds of knowledge we should have, subsector by subsector, so that the subsectors will add up to a total picture for the entire agricultural sector. We need to decide how we can get the needed data most efficiently and we need to know how the whole research job can be most efficiently divided up into interesting and challenging pieces of research from the individual researcher's standpoint.

We need to think of marketing as a multidimensional matrix that must be studied from at least the time, space, commodity, and functional dimensions. We need a clear-cut, hard-hitting study as to which marketing problems or phases should be approached commodity by commodity and which are most efficiently and effectively attacked on a cross-commodity basis. We need to know what kind of overall guides and assumptions are needed so that when some block of work is undertaken by a researcher he can be quite certain that it will fit back into the entire matrix as a stone fits into a cathedral.

Finally, I was pleased with Dr. Shaffer's hard-hitting attack on our fragmented, nonadditive, uncoordinated research approach to the major marketing problems, but his treatment of the solution seems inadequate to me. Consortiums to accomplish something must rest on something more basic than commitment. The system of funding and the chairman's role are crucial. Even regional research would work if we had adequate commitment.

Systems Approach to Marketing Efficiency Research

LEONARD W. SCHRUBEN*

THIS paper is presented to call attention to the potential usefulness of the systems approach to research in marketing efficiency. The body of knowledge concerning systems methods is increasing at a rapid rate and examples of its useful application are numerous. Much remains to be done in providing guidelines to the systems concept for researchers, expecially for those concerned with marketing efficiency. This presentation is an effort in this direction.

The need for more attention to the systems approach was forcefully pointed out in 1965 by the Marketing Research Advisory Committee when it recommended that USDA use systems methodology in research and information procedures. These recommendations were repeated the following year for emphasis. The latter report contained the following statement:

> The Committee is distressed at the apparent lack of response to its 1965 recommendations regarding systems methodology in research and information procedures within the Department and repeats it here verbatim in the hope that it will be given the emphasis and attention we feel it merits: *Increased Emphasis on Systems Methodology.* It is the recommendation of this Committee that a considerably increased emphasis be placed on systems methodology, to the extent of at least one man-year of a professional systems engineer. The purpose of this recommendation is:
>
> *a.* To eliminate duplication of effort by developing a formalized information system within the Research Program and Evaluation Staff, and formalized procedures for making a team approach to appropriate projects.
>
> *b.* To keep researchers abreast of methodology and techniques (e.g., computer programs and hardware) which may be relevant to their studies. The Committee observed several references to use of linear programming where, in its opinion, this technique was not necessarily the appropriate one for the problem under study, and it felt that such reference may have resulted from lack of personnel specifically charged with the area of applying systems methodology.
>
> *c.* To develop procedures for structuring individual research projects so that various interfaces may be appropriately linked up to provide large-scale synthesis of findings to meet such important demands as those of the National Commission on Food Marketing and similar bodies. The emphasis here is on the need for compatibility, full utiliza-

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* The assistance of colleagues Ruth Clifton and Edward Janzen is acknowledged, though they are not responsible for the contents.

LEONARD W. SCHRUBEN *is agricultural economist, Kansas Agricultural Experiment Station.*

> tion on findings, and the avoidance of gaps betwetn closely related projects.

The Committee recommendation is strong language and there doesn't seem much doubt about the purpose of its recommendation. However, correspondence with some members of the Committee disclosed no clear concept as to what constitutes systems methodology. Some members apparently viewed it as a way to organize research itself. In contrast, this paper presents the case for using the approach to solve marketing problems.

The purpose of a systems approach to marketing efficiency research is to determine the relation among various parts and the overall efficiency of a system as a whole. Appropriate analytical models of a system may assist in the discovery of normative solutions which can be compared with real-world conditions or can anticipate the results of one or more alternate courses of action. An ex post analysis of actual situations provides a basis for discovering where improved efficiency can be realized. An appropriate systems analysis will provide information on trade-offs between cost and benefits. Efficiency relates to the quantity of inputs in relation to outputs.

Perhaps it is too early in the life of the concept to formalize a generally acceptable definition. New branches are rapidly being added to the main trunk, so some time may elapse before the full nature of the concept of systems analysis is understood. However, a working definition should be formulated at this time in order to improve the general understanding of the process involved.

Systems Defined

Two dictionary definitions of the word *system* are "an assemblage of objects united by some form of regular interaction or interdependence" and "a complete exhibition of essential principles or facts, arranged in a rational dependence or connection." Thus, a system includes components or elements themselves as well as the relationships among them. Not only are individual firms and government agencies involved in a system but also interactions among them are important.

A subsystem is by definition a part of a system. A set of data which describes a system may, in some circumstances, be divided into subsets, with some of the elements common to more than one subset. These subsets are the basic building blocks to describe an entire system. When all the relevantly related subsets are appropriately incorporated into one set, a systems model results.

It is the combinative interfacing aspect of the subsets which differentiates the systems approach from the traditional single-problem orientation. Specific problems may be identified as in the more traditional approach. However, the systems approach provides specific information relating the effect of alternate solutions of one problem to the overall efficiency of the system of which it is a part and to other subproblems in the same system. Thus, alternative solutions can be evaluated and answers to various subset problems weighed in relation to the overall system. This feature is an especially important addition to conventional methods.

The aim of the systems approach is to provide meaningful answers to important questions in quantitative terms. Often the first step is to describe the interrelationships involved in qualitative terms. An industry flow chart illustrates this step. The term *qualitative* is stressed here to contrast with quantitative or mathematical models. A qualitative model depicts the character and direction of relationships, whereas the quantitative or mathematical model uses numbers to represent these relationships.

A mathematical model assigns numbers and expresses relationships among various parts of the activity in numerical terms. A series of such statements using numbers to describe related events placed in proper order for analysis is one form of a mathematical model. A beginning can be made with a qualitative model by adding numbers to the word descriptions.

A completed model, such as one using linear programming, would provide for the measurement of the interaction throughout the system of a change in one of its parts. Thus, "what if" questions can be answered. Sensitivity analysis and parametric programming are two powerful analytical tools with which to measure trade-offs between costs and returns, as well as determining system benefits and losses by a change in a part of that system. These tools also enable the user to apply concepts of statistical probability to input data.

Building a Systems Model

There are several alternative mathematical procedures that can be used in building a systems model. The choice will depend upon the nature of the problem to be solved (many are not amenable to the quantification process) and the availability of suitable data.

Linear programming has been selected for use in this paper to illustrate the steps in developing an analytical systems model to be used to discover normative answers to a real-world problem. The normative answers obtained from the model are to be compared with the real-world answers to discover potential marketing inefficiencies. Examples A, B, and C are presented to illustrate interfacing aspects of two subsystems. The first subset involves the solution of a transportation problem, the second a merchandising problem, and the third a combination transportation and merchandising problem to show how the two subsets are interfaced. The illustrative examples are based on real-world problems simplified for presentation here.

Example A

This example is an ex post analysis of the allocation of transit tonnage by a terminal grain merchandiser who buys corn from a set of suppliers, sells to a set of buyers, and arranges for shipment from the various points of origin to the several destination points. The specific problem is to sort the supply and demand points to match pairs for each lot in such sets that the total cost for transfer of all lots is minimized.

To demonstrate the use of a systems submodel in analyzing efficiency of a market operation, a review was made of the merchandiser's tonnage allocation of corn shipments by rail for the week of June 5–9. The freight billing actually used was selected initially by the usual method employed by that firm. Any mistakes in the initial selection would have been reflected in the ex post solution. Any transit balances available to the usual method likewise would be available to the model used here. In total, 56 cars of corn were considered. The freight rates applying to the shipments are given in Table 1. These were the lowest rates published in the rail tariffs that would apply.

The origins of the quantities to be shipped are given in the last column of Table 2. The destinations are given in the last row. Since the problem involves transit billing allocations, the quantities can be subdivided to the last pound. However, in other similar problems, carlot quantities have been assigned by using the same method and answers are in similar form.

The model was structured to reflect the actual situation relative to availability of connecting rail lines between each two of the specified points. For example, both the KCS and MP served demand point 6 (D_{6a} and D_{6b}) when corn originated at S_2, whereas only the KCS served D_6 when corn originated at S_3. This connection is identified as D_{6a}. Thus, the restrictions for exact routings were described. This is an important consideration in an actual situation, often overlooked by researchers approaching spatial equilibrium solutions when aggregating. Major errors in conclusions are possible when aggregative data are used.

The management solution is presented in Table 2. The normative solution discovered by ex post analysis is given in Table 3. The ex post analysis indicates that a more efficient allocation was possible which would have resulted in reducing expenses of shipping by about $1 per car.

A second comparison between management solution and ex post solution was made assuming a two-week availability of transit billing. This is a more realistic situation. In this case, the expense could have been reduced by nearly $3 per carload while providing exactly the same service.

The point under consideration here is that these inefficiencies were discovered by an appropriate model of a subsystem which described the actual situation. Such a discovery is not likely by using methods commonly employed by firms in the trade and illustrates the usefulness of this approach to market efficiency research. (This is a clear case of improved ef-

Table 1. Freight rates between supply and demand points[a]

Origin[b]	Destination															
	D_1 (MP)	D_2 (RI)	D_3 (MP)	D_4 (KCS)	D_5 (MP)	D_{6a} (KCS)	D_{6b} (MP)	D_7 (KCS)	D_8 (KCS)	D_9 (MP)	D_{10} (KCS)	D_{11} (MP)	D_{12} (MP)	D_{13} (MP)	D_{14} (Frisco)	D_{15} (KCS)
	cents per 100 pounds															
S_{1a}		14.0		9.0		9.0		14.0	21.0		14.0					13.0
S_{1b}	13.0	14.0	14.0	9.0	21.0	9.0	9.0	14.0	21.0		14.0	16.5	14.0	16.5	9.0	13.0
S_2	13.5	14.5	14.5	9.5	20.5	9.5	9.5	14.5	20.5		14.5	17.0	14.5	17.0	9.5	13.5
S_3		14.5		10.0		10.0		14.5	21.0		14.5					13.5
S_4	12.5	14.5	14.5	9.0	20.0	9.0	9.0	14.5	20.0		14.5	16.5	14.5	16.5	9.0	12.5
S_{5a}		14.0		9.0		9.0		14.0	21.0		14.0					13.0
S_{5b}	13.0	14.0	14.0	9.0	21.0	9.0	9.0	14.0	21.0		14.0	16.5	14.0	16.5	9.0	13.0
S_{6a}		13.5		8.5		8.5		13.5	19.5		13.5					12.5
S_{6b}	12.5	13.5	13.5	8.5	19.5	8.5	8.5	19.5	19.5		13.5	16.0	13.5	16.0	8.5	12.5
S_7	13.0	14.0	14.0	9.0	20.0	9.0	9.0	14.0	20.0		14.0	16.5	14.0	16.5	9.0	13.0
S_8		14.5		9.5		9.5		14.5	20.5		14.5					13.5
S_9	12.5	14.5	14.5	9.0	20.0	9.0	9.0	14.5	20.0		14.5	16.5	14.5	16.5	9.0	12.5
S_{10}										21.0						
S_{11}	13.0	15.0	15.0	9.5	20.5	9.5	9.5	15.0	20.5		15.0	17.0	15.0	17.0	9.5	13.0
S_{12}	13.5	15.0	15.0	10.0	21.0	10.0	10.0	15.0	21.0		15.0	18.0	15.0	18.0	10.0	13.5
S_{13}		14.5		9.5		9.5		14.5	20.5		14.5					13.5
S_{14}										21.0						

[a] Supply and demand points where two rates apply are identified thus: S_{1a}, S_{1b} or D_{6a}, D_{6b}.
[b] All origins are on the Burlington Railroad.

Table 2. Management allocation of corn tonnage for week of June 5–9, 1967[a]

Origin[b]	Destination																	Total available
	D_1 (MP)	D_2 (RI)	D_3 (MP)	D_4 (KCS)	D_5 (MP)	D_{6a} (KCS)	D_{6b} (MP)	D_7 (KCS)	D_8 (KCS)	D_9 (MP)	D_{10} (KCS)	D_{11} (MP)	D_{12} (MP)	D_{13} (MP)	D_{14} (Frisco)	D_{15} (KCS)	
	100 pounds																
S_{1a}		1,100		7,623		4,874		2,405	1,900								17,902
S_{1b}	1,120		1,243		1,490		1,120					2,150	2,240	106	15,331		24,800
S_2			997	217								1,120		1,574	2,967		6,875
S_3				1,281													1,281
S_4															972		972
S_{5a}								1,170									1,170
S_{5b}															3,858		3,858
S_{6a}		1,205															1,205
S_{6b}														969			969
S_7												2,330			2,064		4,394
S_8		1,055		189													1,244
S_9					88									931			1,019
S_{10}										2,163							2,163
S_{11}					322										976		1,298
S_{12}												1,120			1,264		2,384
S_{13}						1,959		225			1,680					1,900	5,764
S_{14}										1,197							1,197
Total	1,120	3,360	2,240	9,310	1,900	6,833	1.120	3,800	1,900	3,360	1,680	6.720	2,240	3,580	27,432	1,900	78,495

[a] Supply and demand points where two rates apply are identified thus: S_{1a}, S_{1b} or D_{6a}, D_{6b}

[b] All origins are on the Burlington Railroad

Table 3. Ex post allocation of corn tonnage for week of June 5–9, 1967[a]

Origin[b]	Destination																Total avail-able
	D_1 (MP)	D_2 (RI)	D_3 (MP)	D_4 (KCS)	D_5 (MP)	D_{6a} (KCS)	D_{6b} (MP)	D_7 (KCS)	D_8 (KCS)	D_9 (MP)	D_{10} (KCS)	D_{11} (MP)	D_{12} (MP)	D_{13} (MP)	D_{14} (Frisco)	D_{15} (KCS)	
									100 pounds								
S_{1a}				5,187		6,833		2,519			1,680					1,683	17,902
S_{1b}															24,800		24,008
S_2			2,240		1,900		1,120					1,615					6,875
S_3								1,281									1,281
S_4														755		217	972
S_{5a}				1,170													1,170
S_{5b}												3,858					3,858
S_{6a}									1,205								1,205
S_{6b}												969					969
S_7												278	2,240	1,876			4,394
S_8				549					695								1,244
S_9														949	70		1,019
S_{10}										2,163							2,163
S_{11}															1,298		1,298
S_{12}	1,120														1,264		2,384
S_{13}		3,360		2,404													5,764
S_{14}										1,197							1,197
Total	1,120	3,360	2,240	9,310	1,900	6,833	1,120	3,800	1,900	3,360	1,680	6,720	2,240	3,580	27,432	1,900	78,495

[a] Supply and demand points where two rates apply are identified thus: S_{1a}, S_{1b} or D_{6a}, D_{6b}.
[b] All origins are on the Burlington Railroad.

ficiency where fewer resources are used to produce the identical goods and services.) A normative answer, where appropriate models are available to describe a situation, can be used to test action in a real-world situation and discover practices which resulted in more efficient marketing.

The same structural model can be used to answer macroeconomic questions: for example, to determine some of the effects of a proposed grain freight change on producers and shippers of various regions affected by such a change.

It might be pointed out that this comparison includes only one commodity, corn, at only one market, at a time period in which corn shipments are relatively small. No argument is made that the week of June 5–9 is representative. However, it seems clear that ex post analysis has revealed that an application of an appropriate model to a full-scale and continuous operation shows promise of continuous and substantial gains in efficiency which require no change in services rendered.

Example B

This example, also abbreviated from an actual problem, will illustrate the use of a model that will provide normative answers which incorporate product quality considerations in addition to quantity and price. It is reviewed briefly to illustrate that it is of a form which can be expanded with an interface with Example A to construct Example C.

In this problem, the corn merchandiser must determine which lots of corn to purchase and which grades to sell, given a schedule of prices, in order to maximize profits. He bids the country on a routine schedule. His offers to buy are priced according to the relative quality attributes of each lot and the usefulness of each lot in blending corn which, after blending, is offered for sale. Thus, there are two price schedules, one to guide purchases, the other to guide sales. Buying and selling are continuous simultaneous operations, with changes in conditions of each occurring constantly. Thus, simultaneous decisions are being made at each moment to fit the conditions of that moment. For the purpose of this illustration, it is assumed that each subproblem represents such a moment of decision.

The terminal facility has a maximum capacity restriction; thus, corn in inventory plus corn purchased cannot exceed the maximum. However, any lesser quantity can be handled.

There are four lots of corn in the elevator. The quality characteristics of each lot that are important in determining selling prices are shown in Table 4.

Four different country sellers have offered to sell corn at quoted prices. A description of the corn offered is shown in Table 5.

All the corn in the bins plus that which is purchased must be sold. It is not necessary that all the corn offered be purchased. Any quantity of any

Table 4. Inventory of corn in the elevator

Bin	No. of bushels at 56 lbs. each	Moisture	Damage	Foreign material	Heat damage	Odor in degree	Market price
		percent					*$ per bu.*
331	38,000	14.9	2.9	3.5	0.05	None	1.39
25	32,000	14.5	4.3	1.9	0.05	None	1.40
342	12,000	14.4	5.3	6.0	0.05	None	1.36
303	15,000	16.0	20.0	4.0	0.05	Sour	1.28

Table 5. Lot description of corn available for purchase

Country seller	No. bu. offered at 56 lbs. each	Moisture	Damage	Foreign material	Heat damage	Odor in degree	Market price
		percent					*$ per bu.*
A-X5	29,000	15.9	3.1	4.0	0.05	None	1.39
B-X22	9,000	14.8	6.8	3.0	0.90	Musty	1.35
C-420	9,000	13.4	7.6	2.8	0.05	None	1.37
D-341	12,000	13.8	40.0	5.0	5.00	Sour	1.23

of the lots offered by any of the four sellers can be purchased. Certain grades can be offered only in quantities not to exceed the demand limitations as specified. The characteristics and special demand restrictions of each grade to be sold after blending are given in Table 6.

Table 6. Price and quality of different grades of corn that can be sold

Identification & grade[a]	Max. moisture	Max. damage	Max. foreign material	Max. heat damage	Odor in degree	Mkt. value of 56 lbs.
	percent					*$ per bu.*
YC 2	15.5	5.0	2.8	0.20	None	1.400
YC 2X	15.5	5.0	4.0	0.20	None	1.385
YC 3	15.5	7.3	4.0	0.50	None	1.370
YC 4	15.5	10.5	5.0	1.00	None	1.350
YC 5	15.5	16.5	7.0	3.00	None	1.330
YC SG 1	15.5	27.0	7.0	2.00		1.280
YC SG 2	15.5	No max.	7.0	3.00		1.230

[a] Specifications for grades YC 2, 2X, 3, 4, and 5 should contain no more than 20 percent from any stocks designated *sour* or 40 percent from any stocks designated *musty* or proportional quantities of *musty* and *sour*.

Given prices and restrictions described above, normative answers to the following questions, as in Table 7, can be obtained:

1. How many bushels of corn should be purchased from each seller?
2. How many bushels of each of the seven grades should be sold?

Table 7. Solution to Example B[a]

Lot	Total quantity	Price	Grade sold								Amount owned plus amount purchased in final mix
			1.40 YC 2	1.385 YC 2X	1.37 YC 3	1.35 YC 4	1.33 YC 5	1.28 YC SG1	1.23 YC SG2	Sold as is	
	bu.	*$ per bu.*					*bushels*				
On hand											
331	38,000	1.39	31,305	6,695							38,000
25	32,000	1.40	32,000								32,000
342	12,000	1.36		3,363		8,072		565			12,000
303	15,000	1.28	4,239	4,055		1,542		5,164			15,000
Offered by											
A X5	29,000	1.39		29,000							29,000
B X22	9,000	1.35	9,000								9,000
C 420	9,000	1.37	3,217	2,815		2,968					9,000
D 341	12,000	1.23				1,218		3,724			4,942
Total	156,000		79,761	45,928		13,800		9,453			148,942

[a] Z =$1,996.86 (profit)

3. How many bushels from each bin and from each lot purchased should be blended for each of the grades to be sold under 2 above?

4. What is the profit from blending?

With answers to the above questions, a firm can determine which trades can be made with efficient use of resources. Through normal arbitrage, the effectiveness of market price discovery should improve through the widespread application of the model.

Example C

This example shows the possibilities of interfacing the data used in the previous two examples. Example A used a linear programing transportation model. Example B used a linear programing diet model. Example C will combine the two into one model to answer simultaneously transport and merchandising problems. This interfacing of subsystems provides a means of deriving normative answers with which to compare real-world solutions where more than one subsystem is involved. For example, changes in the transportation subsystems may be reflected in the diet subsystem and vice versa.

Example C is concerned with combined problems of corn merchandising and transportation. It deals with the distribution of corn having different quality characteristics and illustrates the analytical potential of interfacing models used to solve a series of problems, each constituting a subset of a larger system.

The problem in Example C is that of a grain merchandiser. His objective is to pair shipments of corn from sellers to buyers in order to maximize net revenue.

Six sellers offer various lots of corn priced f.o.b. origin. The quantity, grade factors, and price of each lot are given in Table 8. Each supplier may offer more than one quality; for example, S1 offers three lots.

Table 8. Corn: sellers' offers on day 1

Supplier	Lot	Quantity available	Quality factor (maximum)					Price f.o.b. origin
			Moisture	Damage	Foreign material	Heat	Odor in degree	
		bushels	*percent*					
S_1	S11	1600	14.9	2.9	3.5	0.05	none	$1.235
	S12	1200	14.5	4.3	1.9	0.05	none	1.245
	S13	800	16.0	20.0	4.0	0.05	sour	1.125
S_2	S21	1400	14.5	4.3	1.9	0.05	none	$1.04
	S22	600	14.4	5.3	6.0	0.05	none	1.00
	S23	900	15.9	3.1	4.0	0.05	none	1.03
S_3	S31	400	14.4	5.3	6.0	0.05	none	$1.00
	S32	2200	14.9	2.9	3.5	0.05	none	1.03
S_4	S41	700	16.0	20.0	4.0	0.05	sour	$1.09
	S42	600	14.8	6.8	3.0	0.90	musty	1.16
	S43	800	13.4	7.6	2.8	0.05	none	1.18
	S44	1000	13.8	40.0	5.0	5.00	sour	1.04
S_5	S51	2000	15.9	3.1	4.0	0.05	none	$1.165
	S52	100	13.4	7.6	2.8	0.05	none	1.145
	S53	400	14.5	4.3	1.9	0.05	none	1.175
S_6	S61	100	14.8	6.8	3.0	0.90	musty	$1.165
	S62	200	13.8	40.0	5.0	5.00	sour	1.045
	S63	600	14.4	5.3	6.0	0.05	none	1.175

Five buyers offer to purchase various lots of corn, price f.o.b. destination. The quantity, grade factors, and price of each lot are given in Table 9. Note that several have provided for optional quality within an overall quantity limitation.

The cost of freight between suppliers and purchasers is given in Table 10. A shipment can be made only between those points where a rate is quoted.

The solution, Table 11, answers such questions as the following: (*a*) How much of each lot should be purchased from each seller? (*b*) How much of each lot should be delivered to each buyer? (*c*) What is the maximum net revenue that can be realized?

It can readily be seen that a change in the price asked by one or more sellers or offered by one or more buyers may change the optimum flow of corn. Also, a change in the freight rate between two pairs may change the optimum, or a change in the quality of a given lot may change the optimum flow.

In some cases, profits decline when volume is pushed to capacity opera-

Table 9. Corn: buyers' bids on day 1

Buyer	Lot	Quantity	Quality factor (maximum)[a]					Price f.o.b. delivered
			Moisture	Damage	Foreign material	Heat	Odor in degree	
		bushels	*percent*					
B_1	B11	Max 2,000	15.5	5.0	2.8	0.2	none	$1.625
	B12	Max 4,000	15.5	5.0	4.0	0.2	none	1.605
	B13	Max 1,200	15.5	27.0	7.0	2.0	sour	1.505
		Total ≤4,000						
B_2	B21	Max 1,500	15.5	5.0	2.8	0.2	none	$1.695
	B22	Max 1,000	15.5	7.3	4.0	0.5	none	1.665
	B23	Max 1,000	15.5	16.5	7.0	3.0	none	1.625
		Total ≤1,500						
B_3	B31	Max 2,800	15.5	5.0	2.8	0.2	none	$1.83
	B32	Max 1,600	15.5	10.5	5.0	1.0	none	1.78
		Total ≤3,000						
B_4	B41	Max 1,500	15.5	5.0	2.8	0.2	none	$1.935
	B42	Max 1,500	15.5	7.3	4.0	0.5	none	1.905
		Total ≤1,500						
B_5	B51	Max 1,500	15.5	5.0	2.8	0.2	none	$1.71
	B52	Max 1,500	15.5	10.5	5.0	1.0	none	1.66
		Total ≤1,500						

[a] All lots except B13 should contain no more than 20 percent from any stocks designated *sour* or 40 percent from any stocks designated *musty* or proportional quantities of *musty* and *sour*.

Table 10. Corn: freight rates between buyers and sellers on day 1

From \ To	B_1	B_2	B_3	B_4	B_5
	cents per unit				
S_1		32.5	43	53.5	
S_2		50.0	55	67	
S_3	42.5	50.0	79		55
S_4	28.5	36.5	43	53.5	
S_5	31.5	39	52	61	
S_6	28.5	36.5	43	53.5	

tion, an observed tendency of agribusiness firms. Where any of these conditions prevail, there exists the possibility of inefficiencies in the market system that are discoverable by this method.

Summary and Conclusions

At first glance, the first two examples presented seem not to be much different from the research that has been and is being done. Taken in isolation, they are not different. The difference is in the conversion to subsys-

Table 11. Solution to corn freight-merchandising

Seller	Buyer / Lot	B1				B2		B3			B4		B5		Total purchased	Supply available	Not purchased
		B_{11}	B_{12}	B_{13}	B_1	B_{21}	B_2	B_{31}	B_{32}	B_3	B_{42}	B_4	B_{52}	B_5			
S1	S11					677									677	1,600	923
	S12					696									696	1,200	504
	S13					127									127	800	673
	Total						1,500								1,500	3,600	2,100
S2	S21							1,400							1,400	1,400	0
	S22								299		301				600	600	0
	S23							873	27						900	900	0
	Total									2,599		301			2,900	2,900	0
S3	S31												400		400	400	0
	S32	444	656										1,100		2,200	2,200	0
	Total				1,100									1,500	2,600	2,600	0
S4	S41		247	140				173	55		85				700	700	0
	S42	145	3					22			430				600	600	0
	S43	197	23						99		481				800	800	0
	S44			75					52						127	1,000	873
	Total				830					401		996			2,227	3,100	873
S5	S51		1,291												1,291	2,000	709
	S52	100													100	100	0
	S53	400													400	400	0
	Total				1,791										1,791	2,500	709
S6	S61	100													100	100	0
	S62															200	200
	S63		179								203				382	600	218
	Total				279							203			482	900	418
Total sold		1,386	2,399	215	4,000	1,500	1,500	2,468	532	3,000	1,500	1,500	1,500	1,500	11,500	15,600	4,100

tems by interfacing, as was done in Example C. Even this example provides only a hint of the potential of the systems approach to market efficiency research. Deductively, we can extend the bounds to reach a wide range of conclusions.

For example, a farm production decision block and utilization block could be interfaced with the two blocks already joined in Example C. This sort of linkage would provide information relative to the operation of the entire system that is not now available. Important questions concerned with farm policy issues, as well as with individual firm operations, can be answered by appropriate versions of the model.

Several problems arise in the use of the systems approach. Of first importance is relevance of underlying assumptions. Of nearly equal importance are the mechanical aspects of appropriate models. Obtaining appropriate coefficients to reflect accurately real-world conditions also presents serious problems, especially in its dynamic aspects.

Another assumption to consider is related to the direction of flow of economic cause and effect. An example of the assumption generally implied in farm production models may be that a farmer will adjust his operations in reponse to changes in prices. There is need to recognize that the opposite flow of influence can occur. The relative difficulty of changing farm practices and a degree of flexibility in achieving changes in farm prices may point to prices adjusting to farm practices rather than the other way around. What are needed are analytical tools which are neutral in this respect. The development of a successful systems model should provide one such tool.

The mechanical aspects of mathematical models may cause too much reliance to be placed upon the answers because of the large number of computations involved. For example, some spatial equilibrium models are misleading, and public policy based on answers from them may be dangerous.

A model based on annual flows of grain, for example, may have a built-in bias which will indicate that only centralized control can provide for efficient distribution. In real-world situations, grain is shipped on a day-to-day decision basis with uncertainty, whereas some models use ex post information on an annual basis. The sum of day-to-day decisions by individual firms under the uncertainty assumption can no more than equal the annual model's answer, and this situation could only be accidental. Except under this circumstance, the answers to the annual model will always indicate that a more efficient physical distribution is possible by a central control agency. Hence, constant agitation for central control may result through failure to recognize an implicit assumption.

The basis for comparison in this case is wrong. An idealized rational system should not be compared with a real-world system unless the rational system is subjected to the same uncertainties. The actual results achievable by a central control agency under conditions of uncertainty are unlikely to match the indicated answers from a model to the extent that mistakes by such an agency tend to be biased in the same direction.

Researchers have been leaning towards the systems approach for a long time. Only in comparatively recent times have the mathematical tools and the computational equipment been available. More progress in this direction can be foreseen as experience is gained.

The Advisory Committee's recommendation, cited above, should be taken seriously.

Discussion: Redirecting Marketing Research

WILLARD F. WILLIAMS

The excellent papers by authors Shaffer and Schruben provide interesting similarities and contrasts. Shaffer has presented us with a broad-range, thought-provoking philosophical statement in which he underwrites the systems approach without including the reservations contained in his ERS "working paper."[1] He draws attention to the importance of redirecting marketing research toward the "changing relationships of technology, preferences, and institutions" and to the "idea of simulation in the sense of projecting the flow of consequences from an expected or potential modification of the system." He favors a total systems approach in which market rules and other aspects of market conduct as well as structure and institutions are considered. Shaffer's biases and mine agree fairly well [6, 7].

Schruben, in contrast, confines himself to concrete examples of the systems approach and to improvements in one particular dimension of performance, that is, marketing efficiency. It is in this dimension, obviously, that the systems approach finds its greatest potential, and Schruben ably suggests the nature of this potential. The systems approach is a logical outgrowth of research over the years concerned primarily with operational efficiency. In addition to studies cited in these papers which begin to approach the systems technique, attention might be drawn to many others [1, 2, 3]. Others have been initiated. In cooperation with the industrial engineering department at Texas Tech, Mark Fowler and others of our

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[1] "I suggest the systems model with some reluctance. I believe the most useful knowledge of the economy is to be gained within an institutional context, and I am not convinced the systems model can effectively reflect the interpersonal relations involved. I fear it will be too mechanistic, that it will be too mysterious, and that it will be misused and misinterpreted by those who fail to recognize its limitations" [4, p. 45].

WILLARD F. WILLIAMS *is chairman of the Department of Agricultural Economics at Texas Technological College, and Horn Professor.*

department have undertaken the monumental task, at the request of the Cotton Producers Institute, of building a systematized model of the entire cotton industry from field to mill. Limitations imposed upon the system by traditional practice and trade rules are to be taken into account. Just how this is to be done, however, is a matter of some concern in this study, as I suspect it is to Shaffer and others.

Both Shaffer and Schruben considered the "systems approach," but I am not at all sure that they were talking about precisely the same thing. If they were, there is a degree of logical inconsistency in Shaffer's paper.

Operational efficiency is not a matter of consuming interest to those of us and others who have expressed concern about performance of our agricultural marketing systems. In emphasizing the extent of our "scientific industrialization," for example, Shaffer seems to be saying that industry knows a good deal more than we do about organizing for improved efficiency. Efficiency is precisely the area in which the progress of marketing research has been most impressive. He believes, nevertheless, that a "formal systems modeling of the food and fiber section would be worthwhile." I agree. But suppose we do develop "programs of research which systematically examine and contrast the performance of what is with what might be in the way of organizing the food and fiber sector." What is this going to tell us other than where or how we might improve efficiency? It is true, I suppose, that the initial effort would improve our knowledge and help us identify some critical research needs. But would continued and successful efforts help us regain "lost control of our human affairs, of the direction of our lives, and of what our ancestors would have called our destiny"? Would it provide us with sufficient incentive as well as understanding to "control the process of scientific industrialization"? Properly organized to include the human element, the trade rules, the relevant dimensions of performance, and the externalities, perhaps a systems approach would accomplish all of these things. I am not sure, however, that we have developed methodology for all of this. We encounter the "hang-ups" of which Shaffer speaks, and I suspect that many of these, like the measurement of utility, will remain hang-ups for some time.

Institutionalism or institutional foot-dragging is another hang-up impeding implementation in each of several dimensions. For example, we researchers ourselves listen to highly philosophical critiques such as the one presented to us by Shaffer. We wag our heads in agreement, for we have heard much of this before or perhaps even said much the same thing ourselves; but few changes in the direction of marketing research and little progress are observed. Many specific examples could be cited.[2]

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[2] The report to the Southern regional directors entitled *A Framework for Marketing Research in the South* [5] is one such example. Upon its completion six years ago, it was generally agreed that the statement represented a long and distinct step forward To date we have seen very little implementation.

It will be a long time, I suspect, before Shaffer's suggestions for establishing desks in the USDA and for organizing interagency consortiums are given serious consideration. We have a great deal of institutionalism within and among our own research and educational fraternities.

We face the problem of implementation in getting projects approved and funded. We do about what we are paid to do. So long as we are paid to conduct research in the partisan interests of agriculture or other particular groups, it is going to be difficult, at best, to tackle some of the issues and questions on which Shaffer and others place high priority. Given the people for whom we are supposed to be working, emphasis on efficiency is not surprising.

Why is it, do you suppose, that we are hearing a good deal less today about market structure studies than we did a few years ago? After assembling a considerable volume of data, why did the Food Commission trade a few political blows and then tiptoe out of existence when the questions with which Shaffer is concerned arose? Why in the South has land-grant marketing research concerned with the broiler industry been allocated almost entirely to research of primary benefit to the integrators?[3] Why is it that we have never had much research on institutional arrangements to improve bargaining power of hired farm labor, and why has USDA failed to initiate an aggressive program of research on external effects of water and air pollution by farms, feedlots, or agribusiness firms?

These are interesting questions. Can all of the deficiencies implied be charged to researchers? We can develop Shaffer's social accounts and provide greatly improved informational systems, once society through Congress decides that this should be done and provides the funds and the authority to extract the necessary data for this purposes. We bear some responsibility for public consciousness and awareness of the research needs. In addition, we often do not devote enough attention to strategy for successfully implementing research plans. Clearly, however, our work is affected by certain externalities which must be taken into account.

Even after completion of the suggested research, implementation is a problem. In many instances, little actual research is needed. We frequently know and our industry leaders often know the direction, if not the distance, toward improvements in performance with respect to the externalities, but incentive is lacking. Even in instances where substantial internal benefits are available, subsector institutional barriers often prevent implementation. Perhaps marketing research people, and I am one of them, should do more thinking about some of these matters instead of masochistically tearing ourselves apart.

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[3] The much more interesting questions about the terms of contracts with producers, the degree of autonomy exercised by the integrators, and other internal effects remained almost untouched until the P & S Division of USDA, with its mandatory powers, initiated detailed study and investigations.

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FIRM MERGERS AND MARKET STRUCTURES

CHAIRMAN: W. R. HENRY, NORTH CAROLINA STATE UNIVERSITY

Merger Component of Growth of Agricultural Cooperatives*

LEON GAROIAN AND GAIL L. CRAMER

AMERICAN economic history is rich with examples of business firms that have combined in some form to achieve growth and other objectives. As a result, the merger component of growth is becoming an area of increasing interest to economists [6, 10]. Growth by merger, in contrast to growth by internal expansion, is of importance because of its capability of drastically and quickly modifying firm, market, and industry structures. Economists and regulatory agencies are concerned with the changes in concentration, conduct, and performance which may occur. In addition, stockholders and management of firms considering mergers are interested in the factors affecting merger success. This paper bears on these issues but is not explicitly a traditional market structure approach.

The purpose of this paper is to discuss empirical findings on the extent of merger activity among agricultural cooperatives, the impact on cooperative growth, relative growth of merging and nonmerging cooperatives, and Markov-chain projections of future growth of farmer cooperatives.

Studies on the success of cooperative mergers are scarce.[1] A study by Mueller found that between 1945 and 1955 nearly one-half of the 102 large dairy cooperatives in his study grew, in part, by merger and acquisition [10]. Cooperatives that used merger in this period grew more rapidly than those growing only by internal expansion. Mueller summarizes his study by suggesting that, if growth is a measure of success, then his findings support the hypothesis that merging dairy cooperatives are more successful than those that have relied on internal growth alone. Another study on dairy firms by Hammond and Cook concurs with Mueller's findings that merging firms showed a higher growth rate than nonmerging firms [4].

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* Oregon State University Exp. Sta. Res. Paper 2529.

[1] Six studies made to determine the success of corporate combinations have generally concluded that large numbers of corporate mergers have been unsuccessful. Dewing [3] concluded that mergers during the period 1890–1904 were not successful with respect to expected and actual earnings. Mead [9], continuing Dewing's study,

LEON GAROIAN *is professor of agricultural economics at Oregon State University and* GAIL L. CRAMER *is assistant professor of economics and agricultural economics at Montana State University*

Cooperative Merger Activity

Data on the number of agricultural cooperative mergers before 1940 are incomplete. One study found that for the period 1905–1939, there were 473 mergers among cooperatives [1]. However, since the information on discontinuing cooperatives in that study was not complete, Mueller suggests an additional 162 cooperatives might have been acquired by other cooperatives during these years [10, p. 9]. Between 1940 and 1955 there were 485 mergers among farmer cooperatives, and between 1956 and 1964 there were 391 mergers. In total, from 1909 to 1964, there were 1,349 reported mergers among farmer cooperatives, mostly in the dairy and farm supply industries (Table 1).

Table 1. Mergers among agricultural marketing and purchasing cooperatives by commodity types, United States, 1909–1964[a]

Type	1909–1939[b]		1940–1955[c]		1956–1964[c]		1909–1964	
	number	*percent*	*number*	*percent*	*number*	*percent*	*number*	*percent*
Dairy	74	15.6	190	39.2	170	43.5	434	32.2
Elevator and grain	64[d]	13.5	61	12.5	45	11.5	170	12.6
Fruit and vegetable	120	25.4	60	12.4	31	7.9	211	15.7
Livestock	67	14.2	18	3.7	26	6.7	111	8.2
Miscellaneous marketing	79[e]	16.7	28[f]	5.8	20[g]	5.1	127	9.4
Supply	69	14.6	128	26.4	99	25.3	296	21.9
Total	473	100.0	485	100.0	391	100.0	1,349	100.0

[a] Source of data: 1909–1955, Mueller [10, pp. 8–10]; 1956–1964, Swanson [14, p. 68].

[b] Mergers among agricultural cooperatives classified according to type of commodity of acquired cooperatives. Most of these are believed to be horizontal mergers.

[c] Mergers among agricultural cooperatives classified according to type of commodity of acquiring cooperatives.

[d] Includes some rice and dry bean associations.

[e] Includes 18 cotton, 15 egg and poultry, 10 wool, 3 nut, 2 tobacco, and 31 unclassified marketing associations.

[f] Includes 10 poultry, 7 cotton, and 11 unclassified associations.

[g] Includes 5 cotton, 5 nut, 5 poultry, 1 rice, 1 wool, and 3 unclassified cooperatives.

Impact of Merger on the Growth of Agricultural Cooperatives

The absolute numbers of mergers among cooperatives give an indication of the extent of merger activity. The full impact of mergers on cooperative growth was analyzed by examining the relative amount that cooperatives have grown by external means. Even though the measures of the

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concluded that mergers achieved "conspicuous success" which reflected advantages of large scale. Weston [16], studying the same merger period, did not concur with Mead. Livermore [7] concluded that about 48 percent of the mergers between 1890 and 1904 were successful. A similar conclusion for this same period was reached by the National Industrial Conference Board [11]. A study by Reid [13] on the 1951–1961 merger period found that common stock prices of internal growth companies increased more than twice that of companies following active merger strategies. We have prepared a bulletin titled "Cooperative Mergers: Their Objectives, Success, and Impact on Growth," which will soon be published as a station research bulletin by Oregon State University.

relative impact of mergers on the growth of cooperatives are not very precise, they are useful for providing a general indication. In this section, we examine the amount of external cooperative growth measured by sales and total assets [15].

A complete enumeration was taken of all cooperatives that merged between 1940 and 1964, as recorded by the Farmer Cooperative Service. This enumeration included 434 local cooperatives and 139 regional cooperatives [14, p. 68], which is only about one-half of the number of mergers recorded by Mueller [10, p. 9] and the Farmer Cooperative Service between 1940 and 1964.[2] The method used to isolate the merger component of growth was to take the average size of all acquisitions or mergers as a percentage of the average growth of all cooperatives between 1940 and 1964. This procedure measures only the direct effects of merger and does not take into account the acquired cooperative's impact on future growth.[3] Table 2 shows estimates of the extent to which the overall growth of agricultural cooperatives was due to external growth.

Table 2. Relative importance of cooperative acquisitions in the growth of cooperatives, United States, 1940–1964[a]

Type of cooperative	Gross sales of cooperatives 1963–1964[b]	Gross sales of cooperatives 1939–1940[b]	Growth in sales 1940–1964	Amount of acquisitions 1940–1964	Amount of growth due to merger
	million dollars				*percent*
Marketing[c]	15,437	4,186	11,251	964	8.6
Supply[d]	4,266	762	3,504	54	1.5
All cooperatives	19,703	4,948	14,755	1,018	6.9

[a] These data are for cooperatives acquired by cooperatives only.
[b] Sales data between 1939–1940 and 1963–1964 are not comparable, since figures prior to 1950-51 were neither net nor gross sales.
[c] Deflated by prices of farm products, 1957–1959 = 100.
[d] Deflated by prices paid by farmers, 1957–1959 = 100.

The direct effect of mergers among cooperatives between 1940 and 1964 was to increase the size of all cooperatives by 6.9 percent. Cooperative mergers accounted for 8.6 percent of the growth of marketing cooperatives but only 1.5 percent of the growth of supply cooperatives.[4]

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[2] In this study we used only mergers recorded by Farmer Cooperative Service for which sales volume and assets data were available. Had we used all mergers recorded by FCS, or supplemental FCS records, we would have lacked these data. This explains the difference in the number of mergers reported by Mueller and that used in this study.

[3] See Mueller [10, pp. 39–42] for a procedure for estimating the direct and indirect effects of merger on the growth of the surviving firm.

[4] Mueller [10, p. 31] estimated that, between 1940 and 1955, mergers among co-

The number of noncooperatives acquired by cooperatives has fallen sharply since 1955. Mueller estimated that noncooperative mergers between 1940 and 1955 contributed 6.6 percent of total cooperative growth, 4.1 percent of marketing cooperative growth, and 15.2 percent of supply cooperative growth [10, p. 31].

Therefore, if mergers among cooperatives between 1940 and 1964 account for 6.9 percent, and Mueller's estimate of growth from acquiring noncooperatives remained at 6.6 percent after 1955, then external growth contributed 13.5 percent of cooperative growth.[5] Thus, cooperatives have relied mainly on internal rather than external growth.

Of the local cooperatives that did grow by external means, the proportion of external growth to total growth was 31.7 percent in terms of deflated sales, and 61.1 percent in assets (Table 3). The data in Table 3 are somewhat less reliable than sales because some cooperatives may retain

Table 3. Relative importance of acquisitions in the expansion of local agricultural cooperatives by type of commodity, United States, 1940–1964[a]

Commodity	Number of cooperatives	Total growth due to acquisitions, as measured by sales[b]	Total growth due to acquisitions, as measured by assets
		percent	
Cotton	6	12.16	99.97
Dairy	83	18.27	−434.55[c]
Fruit	31	67.29	772.09
Vegetable	7	26.89	45.24
Grain	139	9.48	14.83
Livestock	11	71.61	−520.21
Wool and mohair	5	−6.13	−953.53
Miscellaneous marketing[d]	1	0.12	0.10
Farm supply	146	24.32	34.66
Total, all local associations		31.71	61.13

[a] These data do not include service cooperatives. Also, these data are for mergers among cooperatives only.

[b] Sales figures are deflated by the wholesale price index for each commodity class [15].

[c] A negative growth rate as measured by total assets implies that the average growth rate of cooperatives in these commodity groups between 1940 and 1964 has been declining even though they have acquired additional assets.

[d] Miscellaneous marketing includes flax, flowers, fur, hay, seed, and tung oil associations.

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operatives accounted for 4.1 percent of all cooperative growth, 3.6 percent of marketing cooperatives' growth, and 5.9 percent of supply cooperatives' growth.

[5] Mueller's estimate [10] is probably an overestimate of cooperative growth from acquisitions of noncooperatives for use between 1960 and 1964 because of the declining numbers of noncooperative acquisitions that have been made in these years.

membership volume but dispose of part or all of the assets acquired in a merger.

Merging regional cooperatives acquired only one-eighth of their sales volume and assets through mergers between 1940 and 1964 (Table 4), considerably less than did local cooperatives. This may be explained by greater excess capacity or more obsolete facilities at the local level, whereas at the regional level many mergers are for purposes of acquiring distribution or processing facilities.

Table 4. Relative importance of acquisitions in the expansion of regional agricultural cooperatives by type of commodity, United States, 1940–1964[a]

Commodity	Number of cooperatives	Total growth due to acquisitions, as measured by sales[b]	Total growth due to acquisitions, as measured by assets
		percent	
Cotton	5	5.78	18.67
Dairy	53	15.20	11.03
Fruit and vegetable	5	30.59	25.51
Fruit	11	97.16	15.82
Vegetable	3	1.73	0.12
Grain	7	4.30	2.22
Livestock	7	2.20	1.70
Poultry	2	−71.11	83.50
Dry bean and pea	1	0.94	0.31
Rice	1	15.09	30.88
Sugar products	1	0.46	1.25
Farm supply	38	7.30	16.42
Total, all regional associations		12.80	12.05

[a] These data include mergers among cooperatives only.

[b] Sales figures are deflated by the wholesale price index for each commodity class.

Relative Growth of Merging and Nonmerging Cooperatives

Comparisons were made to determine whether the 434 local cooperatives that had been involved in a merger grew at a different rate from that of a 10-percent sample of all local cooperatives (with 732 local cooperatives in the sample). These comparisons show that local cooperatives engaged in external growth grew at an average annual rate of 5.64 percent between 1940 and 1964, compared with a 3.58-percent growth rate in sales for local cooperatives growing only internally (Table 5). If total assets are used as a measure of growth, merging local cooperatives grew at an average annual rate of 9.94 percent, compared with 8.99 percent for nonmerging cooperatives. Thus, cooperatives that have used external means of growth have experienced more rapid growth than have cooperatives that have relied only on internal expansion.[6]

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[6] A one-tailed t-test was used to test the hypothesis that, on the average, merging

Table 5. Comparison of average growth rate, measured in sales and total assets, of merging and nonmerging local cooperatives, United States, 1941–1964

Year	Growth rate of 434 merging local cooperatives		Growth rate of 732 nonmerging local cooperatives	
	Sales	Total assets	Sales	Total assets
		percent		
1941	3.325	28.756	2.748	−21.378
1942	9.751	5.446	7.995	1.512
1943	11.855	11.168	6.207	12.497
1944	20.484	40.866	5.910	6.279
1945	5.846	−10.234	1.609	33.189
1946	−0.905	28.201	5.283	41.156
1947	3.104	18.735	1.237	13.799
1948	4.624	16.885	0.639	9.293
1949	5.541	− 4.602	6.197	0.610
1950	−8.359	7.842	−6.887	3.011
1951	−1.637	5.958	3.113	12.810
1952	6.797	12.127	1.864	11.843
1953	3.828	1.779	4.624	5.198
1954	−0.127	9.271	−0.578	3.312
1955	9.858	11.349	4.572	2.298
1956	9.821	7.212	2.309	4.682
1957	4.742	6.863	5.005	8.322
1958	7.331	10.649	5.594	7.667
1959	8.766	15.785	6.334	14.511
1960	7.337	2.957	4.460	4.663
1961	3.545	7.038	5.132	6.283
1962	7.125	6.208	0.022	8.089
1963	4.968	− 4.109	7.837	5.712
1964	7.619	2.414	4.647	20.319
Average growth rate 1941–1964	5.635	9.940	3.578	8.986
Standard deviation	5.44		3.24	

Since mergers occurred over the time period of analysis, some internal growth is included between 1940 and the time of merger. By eliminating the internal growth of those local cooperatives that merged, the average rate of growth after merger dropped to 5.0 percent annually between 1940 and 1964. This implies that local cooperatives growing by merger were growing at a faster rate internally before merger than after merger.

Regional cooperatives involved in mergers grew in sales at an average annual rate of 4.65 percent. Regionals that grew entirely by internal expansion averaged 6.7 percent annually (Table 6). If the internal growth factor is eliminated from total growth, the merging regional cooperatives grew at an average annual rate of 4.29 percent. Thus, regional cooperatives that grew internally grew at a faster rate, on the average, than did

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cooperatives do not grow faster in sales volume than nonmerging cooperatives. At the 5-percent significance level, the critical region is $t > 1.714$. The computed t-value is 2.302, which is the critical region. Therefore, the hypothesis is rejected.

Table 6. Comparison of average growth rate, measured in sales of merging and nonmerging regional cooperatives, United States, 1941–1964

Year	Growth rate of 139 merging cooperatives, measured in sales	Growth rate of 59 nonmerging cooperatives, measured in sales
	percent	
1941	12.480	−33.652
1942	−3.780	84.923
1943	19.947	19.965
1944	20.074	35.945
1945	3.601	− 7.521
1946	−7.202	− 1.007
1947	−3.353	−44.336
1948	−1.239	54.369
1949	7.227	17.507
1950	−3.304	−19.886
1951	−5.538	14.399
1952	9.633	− 6.679
1953	9.991	−10.306
1954	2.803	4.089
1955	1.870	1.816
1956	1.972	− 7.680
1957	3.985	7.892
1958	3.157	14.440
1959	9.091	6.444
1960	2.827	4.121
1961	7.385	1.083
1962	2.346	7.951
1963	8.313	− 2.215
1964	9.287	16.059
Average growth rate 1941–1964	4.649	6.572
Standard deviation	7.11	26.18

those cooperatives that grew externally. As with local merging cooperatives, regional merging cooperatives had a faster rate of growth before merger than after merger.[7]

A comparison of the average annual growth rates of regionals between 1940 and 1964, by type of organization, shows that federated cooperatives grew more rapidly than did centralized cooperatives (Table 7).[8] Nonmerging regional cooperatives, regardless of type of organization, grew more rapidly than did merging cooperatives.

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[7] The comparison may be misleading for regionals, because they can grow externally through centralization or federation with other cooperatives or members through contractual arrangements. This growth, technically external growth, is not taken into account. Thus, it is possible for so-called internal-growth cooperatives to have grown more externally via contracts than did the merging cooperatives by merger.

[8] The limitation described in footnote 7 applies to this comparison also.

Table 7. Comparison of average growth rate, measured in sales of merging and nonmerging regional cooperatives, by type of organization, United States, 1941–1964

Type of organization	Merging cooperatives		Nonmerging cooperatives	
	Number of cooperatives	Average rate of growth	Number of cooperatives	Average rate of growth
		percent		*percent*
Centralized	65	4.89	44	5.90
Federated	39	6.49	9	8.41
Mixed	35	4.51	6	6.63[a]

[a] Mixed cooperative growth from 1951 to 1964.

Even though the rate of growth of internal-growth regionals has been larger than their merging counterparts, the variability of the internal-growth cooperatives was more than three times the variation in the rate of growth of merging regional cooperatives (Table 6). The variation in the growth rates among local cooperatives was the opposite of regional cooperatives. The standard deviation in the external growth rate of locals between 1941 and 1964 was 5.44 percent, compared to 3.24 percent among internal-growth cooperatives.

Future Size Distribution of Local and Regional Cooperatives [2]

The statistical procedure of Markov chains [5] was used to project the future growth of cooperatives, based on the number and size distribution of cooperatives existing in 1956. The Markov process allows for entry into and departure from the industry, and this modification was incorporated into the model.

The Markov process was used to observe the future growth pattern of local marketing and supply cooperatives that grew by external means as contrasted to cooperatives that grew entirely by internal means. Assuming a continuation of factors influencing cooperative operations since 1956, results show that cooperatives using merger as a means of growth and having annual sales greater than 4.0 million dollars have a remote chance of disappearing. The same conclusion held for internal-growth cooperatives with annual sales greater than 1.2 million dollars. The analysis also shows that the larger the size of cooperative, the higher is the probability of increasing in size. The most likely cooperatives to exit and enter are ones with small volumes.

The Markov process indicates only a gradual trend toward fewer local cooperatives than presently exist (Table 8). It is estimated that the number of local cooperatives will decrease from 7,418 in 1964 to 7,238 in 1980, or only 2.4 percent. In the size-class of less than 0.8 million dollars of annual sales, the number of local cooperatives is projected to decrease by

Table 8. **Actual and projected number of local cooperatives per size-class, United States, 1956, 1964, 1972, and 1980**

Year	Size-category[a]									Total
	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	
1956[b]	5,921	1,136	371	143	46	69	16	5	43	7,750
1964[b]	4,596	1,589	597	244	169	80	46	5	92	7,418
1972	3,752	1,626	821	343	267	127	98	39	220	7,290
1980	3,178	1,548	922	422	355	205	147	47	414	7,238

[a] Size-categories based on annual sales in millions of dollars for merging and nonmerging cooperatives are S_1, 0–0.79; S_2, 0.8–1.59; S_3, 1.6–2.39; S_4, 2.4–3.19; S_5, 3.2–3.99; S_6, 4.0–4.79; S_7, 4.8–5.59; S_8, 5.6–6.39; S_9, 6.4 and greater.

[b] Actual number of cooperatives calculated from a 10-percent sample of merging and nonmerging local cooperatives.

almost 31 percent between 1964 and 1980. In contrast to this, local cooperatives with annual sales greater than 6.4 million dollars are estimated to increase by 350 percent over the same period. This does not imply the start of substantial numbers of large cooperatives but emphasizes the growth potential for large local cooperatives.

The analysis shows that the total number of local cooperatives will decrease in number, with mergers accounting for about 50 percent of the cooperatives disappearing in the size-category of less than 0.8 million dollars of sales. Both internal- and external-growth cooperatives have inherent growth tendencies that will increase the number of cooperatives in all of the size-classes above 1.59 million dollars for cooperatives using external growth, and above 0.79 million dollars for other local cooperatives.

Regional cooperatives also show good growth potential, with larger regionals possessing relatively greater potential than smaller regionals. The likelihood of entry of new regionals is small, but the probability of a regional cooperative with annual sales of less than 10 million dollars merging or leaving business is only 35 percent.

The predicted number of regional cooperatives in 1972 and 1980 is given in Table 9. The projected total number of regional cooperatives shows a decrease of 280 cooperatives, or 42 percent, between 1964 and 1980. Disappearance will be primarily from among the small-volume regionals. The number of regionals with sales greater than 80 million dollars annually are projected to increase by 252 percent.

The analysis by Markov chains shows that under existing conditions the vitality of farmer cooperatives in the United States is great. Projections are based on some reasonable relationship of the factors that have existed since 1956 continuing through the 1970's.[9] With this assumption, the anal-

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[9] This may be a heroic assumption, because of the recent entry of new firms and conglomerates in some distribution fields, and a shortening of distribution lines between manufacturers and users.

Table 9. Actual and projected number of regional cooperatives per size-class, United States, 1956, 1964, 1972, and 1980

Year	Size-category[a]									Total
	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	
1956[b]	691	102	35	19	5	3	2	4	13	874
1964[b]	441	67	45	39	13	25	3	2	25	660
1972	237	42	42	44	10	34	7	2	53	417
1980	143	25	34	41	7	33	7	2	88	380

[a] Size-categories in millions of dollars are S_1, 0–9.99; S_2, 10–19.99; S_3, 20–29.99; S_4, 30–39.99; S_5, 40–49.99; S_6, 50–59.99; S_7, 60–69.99; S_8, 70–79.99; S_9, 80 or more.

[b] Actual number of cooperatives calculated from a 10-percent sample of merging and nonmerging regional cooperatives.

ysis indicates that there will be fewer but larger cooperatives, with smaller cooperatives being forced to merge or liquidate their operations. The evidence suggests that regional cooperatives can grow as effectively and rapidly through internal expansion as by merger, assuming no major changes in competitive factors. Local cooperatives that have used external growth are expected to grow only slightly more rapidly than those using only internal growth.

Summary and Conclusions

Mergers among cooperatives have increased in recent years. Most of these mergers have occurred in the concentrated dairy and agricultural supply industries.

Between 1940 and 1964 mergers increased the average size of all cooperatives by about 7 percent. All external growth since 1940 has accounted for 13 percent of cooperative growth. Thus, cooperatives rely primarily on internal rather than external growth.

Individual regional and local cooperatives that have grown externally have grown considerably by merger. However, most cooperatives have approximately the same probability of growing by internal as by external growth.

The Markov-chain analysis shows that all cooperatives have a high propensity for growth, with a trend toward fewer and larger cooperatives.

Both regional and local cooperatives were expanding more rapidly before merger than after merger, indicating that there are restraints to growth by merger. Edith Penrose contends that the limiting factor to the rate of growth of the firm is the limited capacity of the technostructure [12]. Merger, however, should expand the growth potential of the firm, but such factors as planning, integration, and coordination problems are encountered with merger as well as internal growth. Also, at any given time only a certain number of suitable firms are available for acquisition.

Marris suggests that the administrative restraint on the growth rate explains why external growth is so attractive [8].

The biological theories of firm growth make no provision for abrupt discontinuities and changed identity in individual development, and the ecological analogies do not explain the sudden and unpredictable changes in the nature of individual organisms and the consequent changes in their relation to their environment. The most recent theories of firm growth disregard merger; thus, future research on merger should concentrate on the integration of growth by merger into the theory of the growth of the firm.

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Discussion: Merger Component of Growth of Agricultural Cooperatives

CALVIN R. BERRY

The authors have presented a concise and informative statement of the differential effects of external and internal expansion on the growth rate of agricultural cooperatives. Rather than attempt a detailed criticism of their paper, I will try to provide some comments of an explanatory nature and offer some additions which I feel are relevant to this topic.

The conclusions of the authors that firms which have entered into merger arrangements have experienced more rapid growth than firms which have relied only on internal expansion is consistent with the findings of other researchers who have investigated this area [1, 2, 4] and is in keeping with logical expectations. Also, their observation that cooperatives have grown mainly through internal rather than external expansion lends credence to the proposition that both managers and patrons of cooperatives have historically viewed mergers with a great deal of distrust and opposition. This has been especially true of relatively small cooperatives with the result that merger frequently has been resorted to only after all other alternatives were exhausted and the firm was virtually bankrupt. This general reluctance to merge, coupled with the possibility that one or more participants in the merger may be in a depleted financial condition, may help to explain why both local and regional cooperatives, as a group, tended to grow at a slower rate after merging than before merging. Some dissentient patrons may terminate their affiliation with a cooperative in reaction to the merger. Also, time is required to readjust the business of a cooperative following a merger. Therefore, the average growth rate of the merged firm (as measured by expansion of new sales or by a net addition to total assets) may be adversely affected, especially in the short run. These factors undoubtedly contributed to the results of the Markov analysis which suggested that cooperatives using merger as a means of growth require a larger volume of annual sales for continued survival than do internal-growth cooperatives.

Despite the comments by Garoian and Cramer that "the evidence suggests that regional cooperatives can grow as effectively and rapidly through internal expansion as by merger, assuming no major changes in competitive factors," and that "local cooperatives that have used external growth are expected to grow only slightly more rapidly than those using only internal growth," I doubt that they meant to imply that merger is

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CALVIN R. BERRY *is professor of agricultural economics, University of Arkansas, and visiting professor of agricultural economics, University of Minnesota.*

ineffective in accomplishing the objectives of growth. In fact, I submit that firms which elect to enter into a merger arrangement frequently do so by necessity and in response to a unique set of circumstances which may offer no opportunity for growth by internal expansion.

As was pointed out by the authors, merger provides a means by which the structure of the firm, market, or industry can be quickly modified. Thus, given substantial changes in the competitive environment in the market or the industry, a firm or groups of firms may find that merger provides the vehicle by which they can best adjust to the new situation. Frequently in such circumstances, even though opportunities for internal expansion may be available for some firms, accomplishment of some of the objectives underlying the growth process may be possible only through merger.

A case in point is the vigorous movement of dairy cooperatives toward strengthening their marketing position through mergers and consolidations in recent years. Although time limitations do not permit the enumeration and discussion of the changes in the dairy industry which brought about this "urge to merge" among dairy cooperatives, suffice it to say that technological advances in milk production, processing, and distribution have greatly modified the competitive environment in all sectors of the dairy industry. In response to these changes and in an effort to strengthen their competitive position, 43 dairy cooperatives located in 23 states have merged into seven organizations [3]. These mergers have all occurred since January 1967. The combined marketing volume of these seven organizations amounts to 15 billions pounds of milk, or more than 12 percent of the total milk production of U.S. dairy farmers. In addition, several federated dairy marketing organizations such as the Great Lakes Federation, Associated Dairymen, Inc., Central Milk Sales, New York–New England Cooperative, and Pennmarva Dairymen's Cooperative Federation, Inc., have been formed in recent years, adding greatly to the competitive strength of dairy cooperatives through consolidated efforts. It should be evident that realized and potential gains from such organization extend far beyond possibilities attainable through internal expansion.

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Firm Mergers and General Welfare

Peter Helmberger[*]

OVER a decade ago, Jesse Markham complained that the "paths of economic theory and merger literature have rarely crossed" [18, p. 143]. Though the crossings of the last decade or so have also been infrequent, some theoretical fragments have emerged in recent literature that have a bearing on the causes and consequences of mergers. A prime objective of this paper is to bring these fragments together in a critical survey, along with contributions of older vintage. Though occasional reference is made to research findings and policy implications, this paper has a theoretical orientation.

A caveat is in order as a further preliminary. The phrase "general welfare" is not defined in this paper despite its appearance in the title. Rather, long-run perfectly competitive equilibrium is adopted as a norm. This procedure ought at least to facilitate communication except over such performance dimensions as advertising and progressiveness. It also has the dubious distinction of having a precedent established by the U.S. Congress. The Celler-Kefauver Act states, among other things, that mergers which tend substantially to lessen competition are bad.

Why Do Firms Merge?

Merger is here defined as the combining of two or more sovereign firms into a single enterprise. Included is a consolidation in which several firms give up their identities in favor of a new one. This method of growth was used frequently before the turn of the century. A more prevalent form of merger at present is an acquisition in which one company buys another for cash or securities. In either case, one or more decision-makers disappear from the competitive arena.

It is well to distinguish between the motives of buyers and those of sellers in the study of mergers. Although the possible motives of either party are too numerous to mention, the more important ones merit our consideration. A firm might be placed on the selling block because of the death, ill health, or desired retirement of key owners or management personnel. Dissension among owner-managers might have the same effect. In addition, the owner may desire to sell his firm for investment reasons because it might be of greater value to another company than if continued in its present independent state. This might happen because of poor

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Peter Helmberger *is associate professor of agricultural economics at the University of California, Berkeley.*

management, inefficient size, or excessive specialization. On the buyer side, merger might be a quick and sure route to business expansion. The motives for expansion, on the other hand, range from the desire for greater efficiency to the desire for market power.

This simple listing of merger motivations lays bare both the basis and the need for a market for real capital assets. On the argument that the capital asset market allocates assets to those who can put them to the most economic (profitable) use, a law prohibiting mergers would likely have ill effects. On the other hand, allowing all mergers to take place would include mergers where the intent is monopoly. Clearly, from the viewpoint of their welfare effects, some mergers are good and some are bad. The problem confronted in this paper is how we should decide which is which. We start with an examination of economies of size.

Economies of Size

Merger results in the expansion of the firm. This raises the important matter of the economies and diseconomies of size. Size here has reference to the number, variety, and value of economic activities controlled within the firm and comprehends a horizontal dimension (the level of any one output), a vertical dimension (the number of economic activities in vertical sequence), and a conglomerate dimension (the extent of product diversification).

Horizontal integration

The usual textbook discussion of economies of size is limited to economies of horizontal integration. Though theory is pregnant with hypotheses on the sources of economies and diseconomies, the shape of the long-run average cost curve is left in doubt. At an empirical level, several alternative methods have been developed for measuring average cost functions. A number of researchers have concluded on the basis of their studies that the average cost function declines up to some minimum level of output, after which it remains about constant [25; 1, pp. 152–155]. Because of the considerable amount of work done on average cost functions, numerous theoretical and empirical guidelines are available to those attempting to assess the impact of horizontal merger on productive efficiency.

Vertical integration

Agricultural economists have contributed in an important way to economic theory of vertical integration [5, 12, 16, 20]. A brief statement of major results is in order here.

In a world of imperfect information and uncertainty, the need for coordination of economic activity is clearly evident. Organization (an element of the firm) and a market mechanism—or more simply, exchange—are two vehicles for achieving coordination. Both are costly. The boundaries of the firm in terms of the activities controlled therein involve a balancing of the costs of exchange versus the costs of organization in achieving coordination.

The major costs associated with exchange as a coordinative device would appear to result from (1) the ambiguity of price as a signal, (2) market disequilibria, (3) sensitivity of input–output relationships to the time, space, and quality dimensions of products, (4) cost of transactions, and (5) the search for market power or its circumvention. Evidence on the extent and nature of these costs abounds in the literature on vertical integration in agriculture; and historically, agricultural economists have given much attention to ways of decreasing costs of the market mechanism.

The bureaucracy of any large corporation is ample evidence that organization is also costly. The literature on the factors affecting organizational effectiveness, obviously important to the costs of organization, does not allow brief survey [13, 19, 24]. Suffice it here to say that automation, the commuter age, and developments in management science—including programming—may be incalculably important to organizational effectiveness in the future. Kohls argues, for example, that "until recently, the difficulties of effectively managing any large-scale agricultural production by nonresident managers were so great that the costs of such efforts were greater than the potential gain. This barrier, however, increasingly has been reduced as scientific management practices have been developed in agricultural production" [14, p. 193]. More generally, Herbert Simon concludes that facts uncovered in studies of organization "are already calling into question beliefs that allocation through markets simplifies information processing as compared with centralized allocative processes" [24 p. 15].

The last word on the theory of vertical integration has yet to be written, but progress has been made. It is at the level of empirical research that a void exists. Judging from the complexity of the variables involved —nearly all have underpinnings in imperfect information—the void will not be easy to fill. I am not prepared, however, to dismiss this area as a potentially important one for research. Those who feel that the Supreme Court and the antitrust authorities give insufficient weight to economies of vertical integration have a job to be done.

Conglomerate integration

Economies of conglomerate integration or diversification are shrouded in mystery. That diversification might even out the vicissitudes of the profit account is easy enough to see, but there may be other economies and/or diseconomies. The theory of multiple products is formal and unoperational. In this latter connection, the work of Clemens is of some interest. He argues that "what a firm has to sell is not a product or even a line of products but rather its capacity to produce" [4, p. 263]. Starting with some set of operations, the profit calculus runs in terms of the additional costs and revenues associated with adding new products and invading new markets.

The role of organization in business diversification is recognized by Clemens but is given insufficient attention. The modern corporation is or can be a breeding ground for entrepreneurial talent. Junior executives can be given the chance to develop, become leaders, and test their wits against the perils of the marketplace. Commenting on this aspect of corporate life, Peter Drucker argues in what must be an overstatement that "from the over-all point of view, the ability of an institution to produce leaders is more important than its ability to produce efficiently and cheaply" [6, p. 128]. But if the large corporation is a breeding ground for executive talent, then much might be said for finding new herds to manage lest the young bucks languish in frustration while the older leaders grow older and older.

Summary

Where does all this leave us in our analysis of the impacts of mergers on the public interest? Present research on economies of vertical and conglomerate integration support little in the way of empirical generalizations. The burden of empirical research is especially great in the case of conglomerate integration in light of the paucity of systematic theoretical hypotheses. But more than economies of size is relevant to the impact of mergers on the general welfare. There are also the questions raised by competition and internal growth, here defined to include debt financing. These questions are considered below on alternative assumptions regarding economies of size. Horizontal, vertical, and conglomerate mergers are taken up in turn.

Horizontal Mergers

Considered first is the case where, perhaps unknown to the acquiring firm, diseconomies of horizontal integration are present. The minimum of the average cost curve after the merger exceeds that of the acquiring firm before the merger. With highly competitive structure, the superoptimum firm incurs losses in the long run which induce either an enterprise reorganization or an exit.

In an oligopolistic setting, market forces need not eradicate diseconomies springing from excessive size. Market power, by definition, allows the firm leeway in terms of establishing its market policy; the luxury of mistakes can be afforded. Moreover, in an oligopolistic setting, horizontal merger might well be motivated by the lure of monopoly profit or, in corporate circles, the status associated with bigness or rapid growth. Stigler emphasizes how nicely merger can be substituted for perfect or high-order collusion and stresses the possibility that even a transitory monopoly position might be worth creating [26].

In all these cases, it appears that the public interest would be ill served by either internal expansion or merger. Moreover, it should not be supposed that mergers resulting in diseconomies rarely occur. On the contrary, the history of mergers is rife with the wreckage of abortive combinations. When the avarice and speculative fever of stockholders run high, promoters may find the assembling of combinations relatively easy. But the gods punish the greedy. According to Shaw Livermore, 141, or 43 percent, of 328 large mergers made between 1888 and 1905 proved to be failures [15, pp. 75–77]. Many of these were doubtless horizontal mergers aimed at securing monopoly profit [18, p. 158].

Turning to the situation where economies of scale are in the offing, it is again useful to distinguish between atomistic and circular market structure—taking up the former first. In an atomistic setting, a merger that results in economies of scale would likely engender imitation from competitors, with long-run benefits redounding to the consumer. The alternative of internal growth would also be welcomed where demand is strong and production capacity is fully utilized.

The possibility that economies of scale and market power might be the joint product of merger poses difficult problems for theory and public policy A gain in productive efficiency, which may be difficult to measure, must be weighed against a loss in product-mix efficiency, which may be even more difficult to measure.[1] Here, where significant levels of concentration may be present, the welfare gains to be had through internal growth rather than merger might be substantial, though perhaps of short-run duration.

The case where there are neither economies nor diseconomies merits only brief attention in light of the foregoing discussion. A policy that thwarts mergers, given this type of cost curve, would appear highly desirable if there is much likelihood of incipient market power. This is not to say that a market for real capital assets has no function to perform, given constant returns to scale. A poorly managed firm is always a possibility. Prohibiting all mergers would lead to social costs.

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[1] The Congress has apparently weighed the various arguments and decided, in its infinite wisdom, that productive efficiency might best be sacrificed in favor of maintaining many competitors. In the Brown Shoe Case, the Court stated, "Congress appreciated that occasional higher costs and prices might result from the maintenance of fragmented industries and markets. It resolved these competing considerations in favor of decentralization" [3].

There are two loose ends in the above discussion that merit some attention. The first stems from one of Galbraith's recent best sellers [11]. He refers to antimerger policy as a charade given a structural setting in which a few big concerns compete with a fringe of more modest-sized companies. The main thrust of his argument is that large companies will not be broken up, in point of fact, though there might be good reasons for doing so, and that antimerger policy applied primarily against smaller companies prevents them from achieving the strength needed to battle effectively with their giant brethren. This argument, carried to its extreme, would tolerate mergers up to the point where every industry is a duopoly. If small companies are efficient and viable, their ambition to grow might be the source of additional competition, provided that growth is internal. Concentration might actually fall in the process, with a favorable effect on competition. There is evidence that this frequently happens [26, p. 75; 21, pp. 16–18]. Where merger policy is used to prevent small, inefficient firms from combining and where their viability is in doubt, the policy is not a charade. It is simply bad policy. One should not, after all, confuse increased concentration with increased market power. When the small automobile manufacturers began merging several years ago, it was generally taken for granted that the effect was to increase competition, not destroy it.

Finally, merger policy has, in fact, been used primarily to forestall mergers by the largest industrial concerns. A recent report by Willard Mueller indicates that the 500 largest corporations, each with assets of $100 million or more in 1966, were the primary focus of merger enforcement activity. The acquisitions challenged in merger cases involving these large concerns accounted for 92 percent of the assets of all challenged acquisitions [21, p. 6]. Most of the mergers challenged were horizontal in nature.

Another loose end relates to the source of economies. Some economies are private and do not reflect reductions in social costs. Discriminatory discounts awarded to large customers are an example [2]. Such discounts can hardly be used to justify firm mergers.

Vertical Mergers

Turning to vertical mergers, we again start with a competitively structured channel. Clearly, vertical integration through merger would not lessen competition where both the integrating and acquired firms are members of competitive industries. The structural prerequisites for perfect competition are silent on the extent to which firms are integrated. Where mergers result in diseconomies, the resulting inefficient firms will either pass out of existence or dispose of the unprofitable acquisitions. Where economies are present, the public interest would be well served by widespread mergers provided that competitive structure is preserved. Again, however, internal expansion is advantageous to society if no problem of excess productive capacity exists.

Consider next a channel where a monopolist sells a raw material to an industry that is perfectly competitive in the procurement (sale) of inputs (final products). Assume further that the raw material is proportional to the final output for technical reasons. Subject to a major qualification noted later, there is no incentive for the monopolist to integrate forward into final product production, thereby displacing the competitive industry. To see this, plot the demand curve for the final product and the long-run derived demand curve for the raw material in the same diagram, using the proportionality assumption. Also, plot the average cost function of the monopolist before and after integration, assuming neither economies nor diseconomies. Then, for any relevant level of output, the difference between the derived demand curve and the preintegration average cost curve will by construction exactly equal the difference between the demand curve for the final product and the postintegration average cost curve. Hence, the most profitable level of output prior to integration is also the most profitable level after integration; the level of profits is also the same. The argument suggests that oligopolists in a blockaded industry would also not have an incentive to integrate forward into a highly competitive industry. Thus, it appears that we have little to fear from vertical merger in this structural setting.[2]

As to the qualification, entry into the raw material industry might be difficult but not impossible. Forward integration might provide an opportunity for differentiating final consumer products. Entrants would then need to enter two successive stages of production and might need, in addition, to incur advertising expenses in one of them. In the absence of excess productive capacity, there would appear good reasons for adopting a policy which allows forward integration through internal growth only.

A third case is that of vertical merger within the context of bilateral oligopoly. We approach it here through study of the simpler one of bilateral monopoly.

In the bilateral monopoly model with blockaded entry, joint profit maximization results, except under rather special circumstances, in a larger output of final product and a lower price than do either the monopoly or the monopsony solution. Fellner emphasizes the all-or-none contract, specifying quantity and price as a vehicle needed to assure joint profit maximization [10]. The distribution of the profit between the two parties is still left indeterminate, and the bargaining process involved may easily give rise to "strikes" of one sort or another. Such strikes, the resources consumed by the bargaining process, and the planning complications caused by uncertainty—all serve to make exchange a potentially expensive means of coordination. Perhaps the most realistic solution of this model is either backward or forward integration through merger, especially if diseconomies of vertical integration do not exist. If problems of enterprise valuation and control can be solved in a once-and-for-all negotiation, organization may be a far more efficient coordinator of economic activity than the market. Interestingly, vertical merger will tend to push performance toward the competitive solution if diseconomies are not too serious.

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[2] This conclusion does not necessarily follow where the proportionality assumption does not apply. As input substitution possibilities increase, however, it becomes less meaningful to refer to the sole supplier of the raw material as a monopolist.

One other aspect of bilateral monopoly theory is worth noting. Suppose that entry in each industry is difficult but possible. The most favored entrant in the final product (raw material) industry might well be the raw material seller (the raw material buyer). If the seller entered final product production, the buyer's bargaining position would be seriously threatened; backward integration on his part would be almost a necessity for survival. Structural change might easily give rise to duopoly or, in the case of warfare, a vertically integrated monopoly. Though performance is not easily deduced in the event of duopoly, one might find some solace in a lower level of concentration in the final product market. Thus, once the assumption of blockaded entry is relaxed in the bilateral monopoly model, the case for merger, as opposed to internal growth, is seriously weakened.

Turning to oligopoly–oligopsony with blockaded entry, it is an easy matter to construct a model in which mergers between oligopolists and oligopsonists tend to increase output and lower final product price. There is no assurance whatever that the buyers and sellers will be able to reach the Pareto-optimal outcome in the absence of integration. All-or-none contracts would not appear to be generally available. Hence, vertical mergers might well have a salutary impact on market performance. Two qualifications are that (1) final product sellers might have a greater propensity to collude, and (2) concentration might increase in the final product market. The first qualification is a mere possibility, but the second is more serious. There might be some tendency for concentration in the integrated final product industry to at least equal the level of concentration in the old final product industry or the old raw material industry, whichever was greater. If, for example, there were three primary producers and four final product producers, complete integration via vertical mergers would likely lead to no more than three final product producers. Given forward integration, one of the primary producers would likely acquire at least two final product producers. In the case of backward integration, at least one final product producer would likely exit for lack of a raw material supply.

The analytical results change dramatically, however, in an oligopoly–oligopsony case where entry is possible on both sides, for then integration through internal growth is possible. This is especially important where integration economies are present. Entry of new capacity at both levels through integration would presumably lower both concentration and final product price. An antimerger posture would again seem to be wise, especially in the absence of excess capacity.

Vertical mergers in an oligopoly–oligopsony model merit close scrutiny for reasons other than those given above. If entry is already difficult because of capital requirements, complete integration raises the barrier, for the new entrant would then need to enter two sucessive levels. Partial integration would have the so-called percentage effect. Suppose that economies of scale are such that a new entrant must secure 10 percent of total production. Should half of the market become foreclosed by vertical merger, a new entrant must then dislodge 20 percent of the remaining market from existing firms [22, p. 4].

A final structural setting to be considered in connection with vertical mergers is that of successive monopolies [17]. Consider raw material that is used in numerous industries, at least some of which are in an ascending vertical relationship one to the other. Suppose further that the firms in the vertically related industries are perfectly competitive buyers but sell in monopolistic markets. Again, in the presence of complete barriers to entry, an argument can be adduced in favor of vertical merger. Although the proof is a bit technical, the argument rests on the fact that a monopolistic seller always equates marginal revenue with marginal cost in maximizing profit. The theory of successive monopolists implies setting up marginal revenue functions that are associated with other marginal revenue functions rather than with average revenue functions.[3] The argument can be formalized and made applicable to successive, perfectly collusive

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[3] Let Y and Z represent levels of raw material and finished product, respectively, and assume that the final product is proportional to the raw material, $Z = cY$. The profit functions for two succesive monopolists are given by (1) and (2) below, where $Py = Py(Y)$ and $Pz = Pz(Z)$ are two demand functions and where $(a + Py/c)Z$ and bY are linear total cost functions, assuming that $\overline{P}y$ is viewed as a constant by the producer of Z:

$$\Pi y = Pz(Z) \cdot Z - \left(a + \frac{\overline{P}y}{c}\right) \cdot Z. \tag{1}$$

$$\Pi y = Py(Y) \cdot Y - bY. \tag{2}$$

First-order conditions for profit maximization for the producers of Z and Y are given by (3) and (4) below:

$$\frac{d\Pi z}{dZ} = 0; \qquad \frac{dPz}{dZ} \cdot Z + Pz = a + \frac{\overline{P}y}{c} \cdot \tag{3}$$

$$\frac{d\Pi y}{dY} = 0; \qquad \frac{dPy}{dY} \cdot Y + Py = b. \tag{4}$$

Now assume that a merger takes place and that no integration economies or diseconomies oligopolists. In the oligopoly case, however, concentration might well be increased through vertical mergers. Moreover, entry might be difficult but not impossible. In terms of competitive effects, and again as in previous models where entry is not blockaded, vertical expansion through internal means would appear preferable to merger.

Conglomerate Mergers

Turning to conglomerate merger, attention is first focused on the competitive effects of the large conglomerate firm and, thereafter, on the merits of mergers versus internal means as methods of conglomerate growth.

Perhaps the most widely quoted writer on the subject of conglomerate bigness is Corwin D. Edwards, who views the big conglomerate firm with a good deal of misgiving [7; 28, pp. 36–56]. Basic to his position is the belief that the conglomerate has substantial power because of the extent of its resources and the fact that it operates across many markets. It is unnecessary that the conglomerate have a substantial share of the business in any one market, though many conglomerates are so endowed. The aggregation of wealth plus diversification is all that is required. In identifying the advantages of conglomerateness, Edwards fails to note that specialized firms may have advantages of their own. One need not look far to find industries where conglomerate giants are losing ground to smaller companies that are both more profitable and more specialized. The meatpacking industry is a case in point. Moreover, a small firm can diversify; not all conglomerates are big.

For the sake of the argument, however, suppose that conglomerates do possess special power. In some instances, at least, they doubtless do, if for no other reason than because of large market shares. Edwards suggests that the more important implications of conglomerate power have to do with (1) subsidization, (2) reciprocity, (3) full-line selling, and (4) the forebearance that prevails among large conglomerates. Each of these is discussed in turn, though one cannot in short compass deal with them in much detail.

A large conglomerate can use funds from profitable markets to subsi-

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exist. The resulting profit equation and the first-order profit-maximizing conditions are given by (5) and (6) below:

$$\Pi = Pz(Z)\cdot Z - \left(a + \frac{b}{c}\right)\cdot Z. \tag{5}$$

$$\frac{d\Pi}{dZ} = 0; \quad \frac{dPz}{dZ}\cdot Z + Pz = a + \frac{b}{c}\cdot \tag{6}$$

But it follows from (4) that $\overline{Py} > b$ if the demand curve for Y is downward sloping. Therefore, $a+(\overline{Py}/c) > a+(b/c)$. Hence, the Py which maximizes (1) is higher than the Py which maximizes (5).

dize its operations in competition with specialized companies. This much seems true; but why subsidize? One reason advanced by Edwards is to discipline smaller rivals, perhaps driving some out of business so that monopoly profits can be gained at a later time. Predatory pricing is a flagrant violation of the Sherman Act, however, and Turner claims that few cases have been tried in which convincing evidence of predatory practices was presented [27]. It remains true that a conglomerate can discipline specialized competitors. Predacious behavior need not be involved. It is also true that through acquisition and subsequent subsidization a small unprofitable firm can be made into an effective competitor.

Other reasons advanced by Edwards in support of subsidization revolve around bureaucracy and the vagaries of accounting. He argues that conglomerates may be unaware of the profitability of various lines and that unprofitable ones are dropped only rarely when (1) the evidence is very strong and (2) the objections from vested organizational interests can somehow be overcome. That the conglomerate is unaware of the profitability of its various lines is a sad commentary on an economic agent which is to be feared by smaller rivals. Other economists, moreover, have quite different views on the subject. Turner feels that the specialized firm is inclined to hang on until the last gasping gurgle, whereas the conglomerate will know of other good prospects [27]. Gort argues that conglomerates tend in fact to channel investment from old industries to new ones with high levels of concentration, rapid growth, and rapidly changing technologies [29]. Aside from the flow of investment funds to new industries, trained personnel are often reallocated in the process.

Turning to reciprocity, suppose industry A sells to industry B, which, in turn, sells to industry C. An A–C conglomerate can put pressure on a firm producing B, with the following proposition: "Either you buy A from us or we will not buy B from you." Under what conditions would this threat be effective against the producers of B and at the expense of specialized producers selling A? Turner has proposed the following [27]: First, there must not be many alternative A–C conglomerates. Second, the A–C conglomerate must be a relatively big buyer of B so that lost sales, in the event that the threat is carried out, are significant. Third, unless the producers of C are competitive, each will have no trouble selling its entire output at the market price. Turner's list can be expanded upon. Suppose the firms in B sell highly differentiated products. An A–C conglomerate engaged in the distribution of B might find giving up a brand name unprofitable. Its threat will then be ignored.[4]

Regarding full-line selling, Edwards argues that, although tying or full-line forcing agreements are in violation of antitrust legislation, there are subtler ways of accomplishing similar results. Most of these "consist of various methods of using coordinated sales activity and coordinated advertising to promote the full line of products. By spreading sales expense over more products, the seller can often diminish the selling cost for each product" [28, p. 45]. Clearly, such economies benefit the conglomerate; but do they benefit society? Edwards says not; but aside from discriminatory discounts—which can hardly be viewed a social blessing—the questions involved are hard to answer. They pertain to the optimum role of advertising in a market economy.

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[4] This seems to have been one difficulty confronting Consolidated Foods in striving for reciprocity with big food packers [8].

In this connection, Joe Bain distinguishes between informational and persuasive advertising, arguing that a certain amount of the former is needed in a market system but that the latter type is largely a social waste [1, pp. 388–389]. I believe this distinction to be of small merit in appraising the worth of advertising. The purpose of all advertising is persuasion. For some products, factual information may be effective. For others, factual information may be far too complex for consumers to understand or much too boring to learn. In my view, the information that is really important is created when the consumer tries the product and decides for himself whether it is worth the price. On this argument, it is very difficult to specify a norm for advertising expenditures. Lacking such a norm, about all we can do is condemn—with only a reservation or two—expenditures used to defraud and the expenditures of sellers which in the aggregate are self-cancelling and have no impact whatever on industry sales.[5]

Edwards' fourth and last point is that conglomerates "are likely to encounter each other in a considerable number of markets. The multiplicity of their contacts may blunt the edge of their competition" [28, p. 45]. As it stands, the conclusion is an assertion, and the reasons adduced in support of it are not entirely convincing. Moreover, there is room for inconsistency in Edwards' argument. The conglomerate giant cannot outbid, outspend, and outlose the smaller, more specialized company and, at the same time and place, live amicably with other giants.

On balance, it seems difficult to make a strong case against or in favor of big conglomerate business; but this does not mean that we should be indifferent between merger and internal growth. Some of the arguments in favor of the large diversified firm, its propensity to channel funds into new industries, for example, are not applicable when merger is the vehicle for diversification. There is the further matter of barriers to entry. The most favored entrants for industries with high levels of product differentiation and capital requirements are likely to be the large corporations operating in neighboring markets.[6] Not all conglomerate mergers are inimical to the public interest, however. If there is merit in having a market for the capital assets in an oligopolistic industry and if we rule out (1) horizontal mergers that increase concentration and (2) acquisitions by potential entrants in neighboring markets, then the purely conglomerate merger is about the only kind that remains.

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[5] A report of the National Food Commission shows "how large conglomerate food manufacturers may put a tremendous amount of money and promotional effort behind acquired brands" [23, p. 129]. Though the examples cited seem ominous, it is difficult to say why.

Major Conclusions

In conclusion, we have argued that the following considerations are relevant in distinguishing between good and bad mergers, using competitive equilibrium as a norm. First, the market for real capital assets contributes to efficiency through putting assets in the hands of those who can make the most effective use of them. Antimerger policy could reduce the effectiveness of this market. Second, merger can contribute to productive efficiency where economies of size are in the offing. Economies of vertical and conglomerate integration are perhaps especially difficult to measure, and there is always the fear that they will, therefore, simply be ignored. Third, in various structural settings, mergers might be the vehicle for acquiring market power. (The possibility of conflicts between the second and third conclusions is readily apparent.) Fourth, though mergers—especially vertical mergers—would appear to increase efficiency in some structural settings, internal growth might be an even better way of securing the relevant kind of integration. Finally, conglomerate merger merits close scrutiny where (1) a situation conducive to reciprocity is thereby created, (2) the most favored entrants are eliminated in the process, and (3) increased product differentiation is a likely outcome.

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[6] The Proctor and Gamble case provides an illustration [9]. P&G, a large manufacturer of household products, including cleaning agents, acquired Clorox Chemical Company in 1957, the largest seller of liquid bleach. The FTC declared the merger illegal under Section 7 of the Clayton Act. The decision was upheld by the Supreme Court, partly on the grounds that the merger (1) raised barriers to entry in the liquid bleach industry and (2) eliminated a likely entrant into the liquid bleach industry.

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Discussion: Firm Mergers and General Welfare

Filmore E. Bender

I would like to congratulate Dr. Helmberger on presenting a rather well-organized review of the literature of firm mergers. Considering the limitations imposed upon him with respect to space and time, he has done a masterful job. His presentation is straightforward and falters only when the literature falters, as is especially true in the area of conglomerate mergers.

As a result, I feel that there is little that I can say about Dr. Helmberger's paper per se. I believe that he has brought before us what the specialists in the welfare effects of firm mergers have to say. Instead, I want to raise some questions. (I trust that it is a privilege of discussants to raise questions without attempting to provide answers.)

Dr. Helmberger provides us with ample warning at the beginning of his talk that "general welfare" will not be defined in his paper but rather that the "long-run perfectly competitive equilibrium is adopted as a norm." In so doing, he travels in the best of company. However, I would like to depart from such company (at least for today), although I realize that the journey immediately becomes more perilous. Admittedly, using long-run perfectly competitive equilibrium as a bench mark establishes a framework for discussion which places a premium on one of the pillars of economic thought, that is, efficient allocation of productive resources within the society. But this is the very question that begins to gnaw at my mind. Why the continual emphasis on efficient allocation of resources for society as a whole? Before the cry of heresy becomes too loud, permit me to elucidate.

Whenever a firm merger is contemplated which might result in a new firm with substantial (usually undefined) market power, it is judged by economists that the merger is detrimental to general welfare. Why? Usually for two reasons: (1) the increased market power results in an income stream to this firm which is larger than would have existed otherwise, and (2) this increased market power results in a malallocation of resources and hence a reduction in the total product which society would otherwise enjoy. I would not attempt to deny these probable results nor to imply that this is not a deviation from the long-run perfectly competitive equilibrium which is usually defined as a norm. It is the definition of this norm which bothers me.

Filmore E. Bender *is associate professor of agricultural economics at the University of Maryland.*

In a society such as ours, which has demonstrated its capacity to produce an abundance if not a superabundance of goods, is the malallocation of resources, so that total output is reduced, such a heinous crime? Admittedly, the increased income stream for a group within the society may be considered undesirable. On the other hand, our federal government is actively passing legislation to increase the income streams of some groups within the society (for example, school lunch programs, aid to dependent children, and minimum wage laws). Hence, increasing the income streams of groups above what they would otherwise be is considered desirable or undesirable depending upon the circumstance of the group.

There is another point which should be made. In the final analysis, this point may dwarf the other aspects of this problem. This final point is the question of stability. Psychologists tell us that one of the basic principles of life is homeostasis [2, p. 5], that is, the desire of an organism to attempt to maintain an internal equilibrium in the face of a changing environment. The maintenance of such an internal equilibrium of course takes effort.

If a merger results in stability in prices, employment, etc., what is this worth to society? I am familiar with the proofs that fluctuating prices are beneficial to consumers on the one hand and to producers on the other (1; 3, pp. 191–194). However, I also realize that these proofs require mutually exclusive assumptions, and I am willing to say for the moment that their case is unproven for society as a whole.

In summary, what I have said is this: If a merger results in a new firm with substantial market power, we cannot immediately conclude that the merger is detrimental to society. The reduction in total output is, of course, a loss. However, in a society of abundance there may be offsetting gains. First, the group which receives the increased income stream may be considered deserving. Second, even if this group is considered undeserving, the creation of a monopoly or near-monopoly position may result in stability within a sector of the economy, thereby resulting in a net increase in "general welfare."

To evaluate these aspects perfectly, we would have to make interpersonal comparisons. Perhaps it is time that the economists turned to the sociologists and especially to the psychologists with a plea for help in this area of study.

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CONTRIBUTED PAPERS: MARKETING, PRICES, AND CONSUMPTION

CHAIRMAN: MILTON MANUEL, KANSAS STATE UNIVERSITY

A New Look at Demand Analysis for Beef

EDWARD UVACEK, JR.

MOST agricultural demand analyses include, as separate variables, factors that cause the demand curve of the commodity to shift [6]. This type of measurement, together with an assumed predetermined supply and thus an almost vertical supply curve, yields the economist somewhat of an average demand curve, but its usefulness in forecasting is significant. It was pointed out by Working that the true demand and supply curves need not be constructed if the analyst only wants a method that will help him forecast prices [10, pp. 212–235]. Even though many economists emphasize the structural reliability of their models, the unwritten but real ultimate goal is generally to forecast or predict the future. This paper is offered, therefore, to stimulate some new concepts dealing with price prediction or price analysis.

Demand Shifts in Beef

It is generally assumed that changes in tastes and preferences for beef, and the consequent shifts in demand, are influenced primarily by the per capita income of consumers [3, p. 12]. During the last 33 years, however, per capita disposable income has failed to increase in only two years. The use of this factor as being indicative of a "demand-shifting force," therefore, assumes an annually increasing demand for beef. This concept of a gradually changing demand is accepted by most contemporary economists [1, p. 16; 8, p. 41; 9, pp. 35–36].

The long-run growth record for any commodity is determined, not only by changes in demand, but also by adjustments in production. Improved productivity has expressed itself in increased livestock output and rising efficiency in the use of labor and capital [1, pp. 26–27].

Abrupt or gradual changes

A review of the price and consumption data indicates that adjustments or shifts in the demand curve for beef are not continuous occurrences as implied by earlier studies. Waugh's analysis, for example, suggests that abrupt shifts in the demand for beef actually do occur and that these

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EDWARD UVACEK, JR., *is associate professor of agricultural economics at Texas A&M University.*

shifts may be due, in part, to shifts in supplies of competing meats [8, pp. 40–42].

An analysis of annual beef prices and per capita consumption data indicates that years of increasing quantities of beef do not reflect the same price reactions as periods of decreased supplies. This implies that the demand curves for beef may be only one-way relationships or irreversible—a rising quantity yielding a distinct demand curve that is not retraced when a reduced-quantity situation occurs. This concept assumes that a separate demand curve exists for each increasing phase of production and more inelastic curves dominate during the supply-reducing periods. Shifts of these curves occur, in this case, only at intervals and seem to be tied to both the production cycle and time.

Regardless of which beef demand-shifting concept is accepted, it seems obvious that (1) the shifts do occur, (2) they are abrupt, and (3) the isolation of the cause is a necessity in the development of an accurate forecasting model.

Timing of demand shifts

Most authors dealing with demand analysis of beef have not recognized these abrupt shifts in demand and make no adjustments for them. This oversight has usually resulted in the development of a single regression equation for the entire period under consideration, with only disposable income as a shift factor. Improved statistical fit is sometimes accomplished by a division of the years under study into equal periods. This arbitrary separation of the research years, however, seems to lack sound economic basis [5, pp. 24–25].

A further analysis of beef production changes indicates evidence of a relationship between these shifts of the demand curve and the cattle numbers cycle. Contrary to popular belief, the cattle cycle (fluctuations in inventory numbers) is positively correlated with slaughter levels [7, p. 5]. Cattle numbers can, therefore, be used as a fairly reliable indicator of supplies of beef. This relationship between numbers and slaughter is highly important, since the cyclical changes in numbers can be used to provide a time element for these demand shifts.

Income and Demand

Increased per capita incomes and adjustments in tastes and preferences have influenced the demand for beef. It is possible, however, that the net influence of a rise in income with regard to beef purchases has changed in recent years.

The changing role of income

In most contemporary meat analyses, earlier econometric models were relied upon which utilized per capita disposable income quite successfully as a demand indicator. Since 1950, however, disposable income and beef prices have shown little association [4, p. 716].

The lesser interdependence of beef and consumer income in recent years can be explained by a number of economic and sociological phenomena: (1) during the first half of the twentieth century, the desire for beef was reinforced by income gains; (2) the social and income strata of the U.S. population is changing drastically, so that increased incomes, to the affluent society of the 1960's, might offer little added incentive to larger purchases of beef; (3) past shifts of tastes and preferences from pork to beef cannot continue without leading to some diminishing utility due to a lack of variety; and (4) other substantial demand factors, such as the government beef purchases for the school lunch and food stamp programs, have little direct relationship to a rise in per capita disposable income.

Accumulated demand

Since these exogenous factors are continually changing, it becomes even more difficult to reconcile the abrupt changes in demand with the gradual adjustments in income and preferences. One hypothesis that provides a realistic explanation of this conflicting situation involves both rising incomes and a shift in demand related to the beef production cycle. During the buildup phase of the cattle cycle, when larger quantities of beef are being consumed per capita, the higher incomes are utilized and the increased preferences for beef satisfied by making larger quantities of beef available to the consumer. This "penned up" or "accumulated" demand is utilized, not by a shift, but by a movement along the demand curve, and does not really evidence itself until beef supplies are withdrawn from the market. This situation occurs during the liquidation phase of the cattle numbers cycle, when beef supplies, in general, are decreasing. The result is a new and more inelastic demand curve during these reduced-supply periods, yielding substantially higher beef prices near the terminating years of this phase of the cycle.

This concept of a delayed reaction to a change in income and the resulting demand shifts is somewhat illustrated by use of annual beef prices and per capita consumption data (Fig. 1). Demand curves portrayed by the solid lines marked D_1D_1 and D_2D_2, in both cases, represent the average demand during the buildup years of the cattle cycle—1949 through 1954 and 1958 through 1964. During the liquidation years of the cycle, the price–consumption relationship seems to follow what might be called "interim" demand curves, shown by the dashed lines d_1d_1 and d_2d_2.

Since variations in cattle numbers are quite predictable, this cyclical explanation of shifts in demand provides valuable insights as to when such shifts may occur. Goodwin also emphasized this and stated that

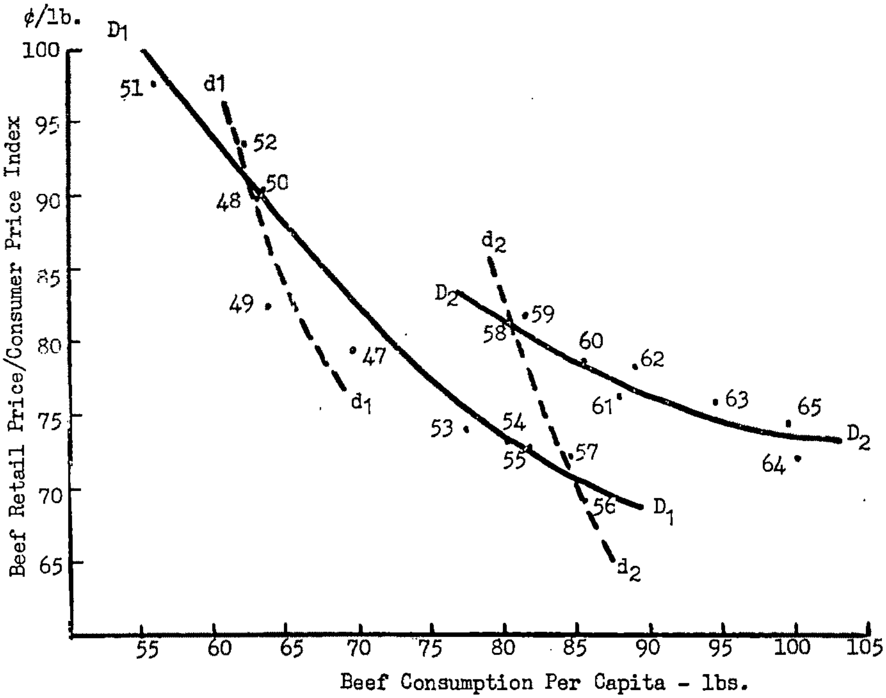

Figure 1. Shifting demand curves for beef

changes in demand for beef become apparent at fairly distinct time intervals and that excessive increases in production between these time periods almost invariably resulted in depressed prices [2, p. 7].

Several different coding systems were tested in a multiple regression analysis to delineate the effects of these alternate production periods. The one coded variable that proved significant separated the buildup years of the cattle cycle from the liquidation years. It consisted of a simple numerical coding of each phase of the cattle cycle: 1 for 1947–1948, 2 for 1949–1954, 3 for 1955–1957, 4 for 1958–1964, and 5 for 1965–1966. Thus, the years were separated into distinct time periods, each representing one phase of a particular cattle cycle. Such coding also allows for identification of future cycles.

To test this hypothesis, a multiple regression analysis of annual data from 1947 to 1965 was accomplished, using this additional "demand shift" factor as a separate independent variable. The equation developed was

$$\begin{array}{lccccc} Y = 43.8852 & -0.7433X_1 & +0.0596X_2 & -0.2242X_3 & +0.0375X_6 & -2.0952X_8, \\ t \text{ value} = & (5.8553) & (0.3156) & (0.9514) & (2.7007) & (1.1370) \end{array}$$

where

Y is wholesale choice beef carcass price — weighted average of 5 major cities (dollars/hundredweight ÷ wholesale price index),
X_1 is beef production per person (pounds),
X_2 is pork production per person (pounds),
X_3 is broiler production per person (pounds),
X_6 is disposable per capita income (dollars),
X_8 is demand shifter (coded value), and

$$R^2_{y\cdot 12368} = 0.9142, \qquad S_{y\cdot 12368} = 2.3007, \qquad R_{y\cdot 12368} = 0.9562^{**}.$$

This equation, further subjected to a step-down regression analysis with elimination of variables not significant at the 5-percent level, gave the reduced equation:

$$Y = 55.6680 - 0.7626X_1 + 0.0327X_6 - 3.3619X_8$$

$$R^2_{y\cdot 168} = 0.9077, \qquad S_{y\cdot 168} = 2.222, \qquad R_{y\cdot 168} = 0.9527^{**}.$$

Since each demand shifter was statistically significant, the final solution to this demand curve analysis may lie in the simultaneous and combined effects of both. The hypothetical pattern offered assumes beef demand curves which have annual adjustments due to changes in per capita income and abrupt shifts in line with production cycle alterations.

Conclusions

Results of this analysis indicate that demand shifts for beef are caused by both the production cycle and income changes. A typical demand analysis, even with the addition of a production shift variable, still yields only average demand curves which represent numerous small shifts due to income changes. The constantly shifting demand curves in a particular production period, therefore, are probably the result of changes in per capita income, whereas the abrupt shifts are due to changes in the production cycle. The real difficulty in such an analysis is to obtain a measurable value for these shifts, since each is of a different magnitude and results in a completely new curve with a distinct slope.

This cycle–time analysis or compounded-shift concept of the demand curves for beef provides an explanation for demand shifts that may serve as a tool for the analyst in forecasting prices. The foundation of this demand-shifting concept, however, must be further studied and refined.

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Buyer Strategy in Bilateral Oligopoly

RONALD D. KNUTSON*

MANY agricultural markets are characterized by an oligopolistic structure on both the buyer and the seller sides. Most traditional price theory models assume that at least one side of the market is purely competitive. The theoretically expected results of such a model are fairly well specified [1, 6]. In reality, however, a model which assumes that one side of the market is purely competitive is applicable in only a limited number of cases—retail sales to consumers, for example. These models are not applicable to many of the intermediate agricultural markets between the producer and consumer levels.

Even though oligopolistic structures frequently exist on both the buyer and seller sides of intermediate markets, empirical work on the industrial organization of agriculture frequently pays little attention to the buyer side of these markets and its influence upon seller conduct and market performance. This criticism is not, however, limited to market structure research, since much of the research in agricultural economics still assumes a purely competitive buyer and/or seller structure.

This paper is designed to indicate some of the interrelationships which exist in the market policies among buyers and between buyers and sellers in bilateral oligopolistically competitive markets. Emphasis is placed upon the strategies which food retailers utilize in their negotiative relationships with fluid milk processors. It was hypothesized that the concentration of milk purchases in the hands of a few retailers not only makes it possible for them to affect the market policies of one another but also has a significant impact upon the conduct or policies of milk processors.

Theoretical Framework

A bilateral monopoly model provides a theoretical framework for analyzing structural imperfections on both the buyer and seller sides of the market. Although bilateral monopoly assumes a single buyer and seller, Scitovsky [5, p. 414] and Fellner [2, p. 240] note that the theory can also be extended to problems of bilateral oligopoly or bargaining.

The distinguishing feature of oligopoly is that each firm can, by changing its own price or nonprice policies, bring about a change in its rivals' policies [4, p. 115]. The theory of bilateral monopoly suggests that in bilateral oligopoly not only does a change in the market policies of one

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RONALD D. KNUTSON *is assistant professor of agricultural economics at Purdue University.*

firm affect its rivals' policies but also it affects the policies of firms on the other side of the market.

Procedure and Market Structure

The results presented were derived from a market structure case study of five Minnesota fluid milk markets [3]. In the study, all processors and supermarket retailers with three or more stores were interviewed. The emphasis in the interviews was to determine the strategies which buyers and sellers of milk used with respect to one another in wholesale fluid milk markets.

Both the buyer and the seller sides of the markets studied were oligopolistically structured. The four largest processors in four of the five markets sold over 90 percent of the milk, and in the fifth market they sold 38 percent of the milk. The four largest retailers sold from 40 to 50 percent of the groceries in markets where over 80 percent of the milk was sold through stores.

Buyer Strategy

Buyers of milk in the five markets indicated that in purchasing milk they had two main interests or concerns. First, they were interested in purchasing milk of a uniform and acceptable quality at a price which was consistent with processor costs of moving milk from the producer to the store. Second, buyers did not want to pay a higher price for milk than that paid by a competitor. These concerns were expressed by all of the buyers interviewed, and a majority indicated that the concern that all buyers pay the same price was most important. These buyers stressed that if they had to pay a higher price, they would be placed at a competitive disadvantage in the retail market.

In the interests of obtaining a justifiably low price and not paying a higher price than competitors, retailers were found to use five main strategies in their negotiations with milk processors:

1. They made options with actual offers of lower prices.
2. They made options by bluffing offers of lower prices.
3. They transferred processors.
4. They concentrated milk purchases.
5. They threatened to integrate vertically

Offers of lower prices

When asked what bargaining tool retailers most frequently used to induce price and nonprice concessions, 24 of the 25 processors stated that the contention that a competitor had offered a lower price was the most frequently used bargaining tool. It was frequently stated by processors that once a retailer received a lower price offer from a competitor or knew that another retailer was receiving milk for a lower price, the retailer would inform the processor that he would either have to meet the offer or be cut off as a supplier. In this sense, retailers tended to act as all-or-none option-makers in their bargaining relationship with milk processors and thereby had a direct effect on price relationships in the five markets.

Although there was substantial variation among markets, eight of the retailers from major local, regional, and national chains indicated that they were contacted as frequently as once a month by a processor other than their regular supplier concerning the possibility of switching suppliers. This contact frequently involved an offer of some type of price or nonprice concession.

Bluffing

Sixty-four percent of the processors interviewed in the five markets indicated that they had encountered instances where retailers were bluffing offers of lower prices. Bluffing was, however, generally limited to the small-volume retailers, who were at a competitive disadvantage because of quantity discount pricing systems. Bluffing was also frequently used by retailers in markets where there was a low level of price competition. The use of bluffing as a strategy resulted in processors' making a special effort to check out alleged price concessions before meeting the price. Checking frequently involved contacting the alleged offering processor and attempting to get him to confirm or even rescind the offer. By checking, processors avoided undermining the existing price structure in the markets involved.

Transfer of suppliers

The ability of a retailer to transfer suppliers at a moment's notice is an important bargaining tool. With the private label, a retailer can switch suppliers without the consumers' knowledge. The private label brand of milk thus gives retailers great flexibility in transferring suppliers.

A retailer's threat to switch suppliers is not taken lightly by a processor. From 1957 to 1967, 15 retail accounts with average annual milk purchases of 453,000 dollars switched suppliers in the five markets. These accounts ranged from 50,000 to 1.5 million dollars per year and accounted for as much as 50 percent of the processor's volume. According to the retailers involved, an offer of a lower price was involved in 87 percent of these transfers. Other reasons mentioned for transfers were offers of nonprice concessions, unwillingness of the processor to supply a private label, inadequate service, and vertical integration by the retailer.

The switch of a retail account from one supplier to another can be an important factor contributing to increased price competition in a market. This increased competition results both because a lower price frequently exists in the market as a result of the transfer and because the processor who lost the account often becomes a more aggressive competitor. He is more aggressive because it is frequently necessary for him to attempt to recoup the lost sales and because he sometimes seeks revenge against both the retailer and the competitor who gained the retail account.

Retailers found it advantageous to remain flexible in terms of making no fixed verbal or written contractual commitment to be served by a supplier over a specific period of time. Retailers indicated that they were concerned about becoming too closely tied to a single supplier. Close ties were considered to jeopardize the retailer's bargaining position because other potential suppliers might begin to feel that the retailer's business was not transferable. If this were true, the retailers stated, they would no longer receive offers of price or nonprice concessions which they could use to bargain with their regular suppliers.

Concentration of milk purchases

Most retailers attempted to concentrate enough milk purchases with a single supplier so that their purchases constituted a substantial proportion of the processor's total milk business. As a result of this policy, most retailers have only a single private label supplier. Sales to the largest retailer averaged 1.0 million dollars per year, or 19 percent of total sales for processors that sold private label milk.

In the store, the private label brand nearly always received the largest proportion of shelf space. In addition, at retail the private label was generally priced one or two cents below the processor brand. Retailers indicated that the principal purpose of concentration of purchases, shelf space allocation, and private label differentials was to build up customer loyalty for the retailer's products. Processors indicated that the purpose was to concentrate enough purchases in the hands of a single supplier so that the loss of the account would be a substantial hardship on the supplier; the retailer would then be in an advantageous bargaining position.

Vertical integration into processing

The least frequently used but potentially the most powerful strategy of retailers was the threat of integration into fluid milk processing. Although integration had not yet taken place in fluid milk in the five markets, integration by a retailer into ice cream processing in Minnesota and integration into milk processing in other parts of the state and country made this threat very real to milk processors. To make the threat even more apparent, retailers would hint that they were considering the possibility of integration. Over 50 percent of the processors indicated that this strategy had been used by retailers to secure price concessions. One large processor indicated that the possibility of retail integration was one of the major considerations in his firm's low price policy. Retailers indicated that they were prepared to integrate if their calculations indicated that they could process milk more cheaply than they could purchase it from their suppliers.

Conclusions

One could generalize from this study that the dominant strategy of the retailer was to make certain that the processor–supplier knew that his milk business was insecure. This insecurity tended to enhance the bargaining position of the retailer and thereby insure that he was obtaining milk at the lowest price. The results confirm the hypothesis that concentration of purchases in the hands of a few retailers makes it possible for them to affect the market policies of one another and to also have a significant impact on the market policies of milk processors. Buyers in this study exercised considerable market power and had an important impact upon the nature of competition and in turn upon market performance. The study thereby indicated the importance of including consideration of the buyer structure in agricultural economics research.

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Quantity and Quality Components for Income Elasticities of Demand for Food*

W. WHITNEY HICKS AND S. R. JOHNSON

INCREASES in food expenditure can be devoted to increasing the quantity of food consumed, increasing the quality of the diet, or more generally some combination of the two [3, p. 538]. The fact that individuals can increase expenditures on food by increasing both the quality and the quantity of food consumed results in sharp contrasts in the food expenditures between high- and low-income countries. Kuznets, for instance, found that per capita expenditures for food in countries with per capita incomes above $1700 were more than five times as high as in countries with per capita incomes below $200 [5, p. 27]. These differences in food expenditures suggest that as incomes increase above subsistence, individuals begin to include items of higher quality in the bundles of goods which they purchase.

If this observation is true, then it would be quite important for both high- and low-income countries to know how the quantity and quality of the food consumed is reflected in expenditures. That is to say, a knowledge of the quantity and quality components of the income elasticity would be helpful in anticipating and adjusting to changes in the level and composition of demand for food that occur in the course of economic development.

The purpose of this paper is to present a simplified model for determining the makeup of income elasticities in terms of quantity and quality components. Once the proposed model is set out, a procedure is developed for estimating the associated parameters, using cross-sectional data from the national accounts of a sample of countries with per capita incomes ranging from $150 to $2,000. Resulting estimates are then assessed for their implication in connection with policies for countries with differing levels of per capita income.

Identifying Quality and Quantity Components of an Income Elasticity

Consider a particular expenditure on food, F. Let X be the quantity of food in F and let Y be the quality of food in F. We assume that F is functionally related to X and Y

$$F = g(X, Y). \tag{1.1}$$

In addition, it is assumed that individuals' consumption of food is a func-

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W. WHITNEY HICKS *is associate professor of economics and* S. R. JOHNSON *is associate professor of economics and agricultural economics, both at the University of Missouri.*

tion of per capita income. With I denoting the per capita income, this function is specified in the equation

$$F = h(I). \tag{1.2}$$

Taking the total differentials of equations (1.1) and (1.2) and setting them equal to each other gives, on a slight rearrangement of terms,

$$\frac{\partial g}{\partial X}\,\frac{dX}{dI} + \frac{\partial g}{\partial X}\,\frac{dY}{dI} = h'(I), \tag{1.3}$$

where

$h'(I)$ is the derivative of the equation (1.2) with respect to I,
dX, dY, and dI are arbitrarily small changes in the noted variables, and
$\partial g/\partial X$ and $\partial g/\partial Y$ are partial derivatives of equation (1.1) with respect to X and Y.

Multiplying both sides of equation (1.3) by I/F yields an expression for the income elasticity for food in terms of a weighted average of two terms. For sufficiently small changes in X, Y, and I, the two terms on the right-hand side of equation (1.4) can be interpreted as quantity and quality components of the income elasticity.

$$\left[\frac{\partial g}{\partial X}\,\frac{X}{F}\right]\left[\frac{I}{X}\,\frac{dX}{dI}\right] + \left[\frac{\partial g}{\partial Y}\,\frac{Y}{F}\right]\left[\frac{I}{Y}\,\frac{dY}{dI}\right] = h'(I)\frac{I}{F}\,. \tag{1.4}$$

The first term in equation (1.4) is a product of two expressions which are rather easily interpretable. $(\partial g/\partial X)\,(X/F)$, hereafter called a quantity weight, indicates how food expenditures change with the quantity of food consumed, and $(I/X)\,(dX/dI)$ is a quantity elasticity. Together the two terms give the quantity component of the income elasticity. The second term can be interpreted similarly with respect to quality. For previously mentioned reasons, we will expect the quantity component of the income elasticity to decrease in relative importance as the level of income increases.

Data and Estimation Procedure

Data used in estimating the income elasticities are from a cross section of 21 countries.[1] Total per capita expenditure on food is used as the variable F, calories in the diet as the quantity variable X, and the ratio of calories from nonstarchy foods to calories from starchy foods as the measure of the quality variable Y. I is, of course, per capita income.[2]

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[1] An effort was made to get a group of countries with a representative range of per capita incomes. However, the group was limited to those countries for which data were readily available.

[2] Per capita income data for 1961 are from Rosenstein-Rodan [7]; data on total calories, calories from nonstarchy foods, and calories from starchy foods for 1960–1962 are from the United Nations [9, pp. 442–456]; and data on per capita food expenditures for 1960 are also

A two-stage procedure was employed in estimating the income elasticity or the function (1.4).[3] First, the function (1.1) is estimated. It then is solved for the values of the quantity (X) and quality (Y) variables consistent with the predicted values of F. These derived quantity and quality variables are then regressed on per capita income to estimate the quantity and quality elasticities required in equation (1.4). Together with the weights derived from the function estimated for equation (1.1), these values were used to calculate income elasticities.

In fitting the data, several functional forms consistent with our rather general *a priori* restrictions on function (1.1) were tried. On the basis of the standard measures of fit, a semilog function seemed to be the most satisfactory of those tried. Both constant and variable elasticity functions were used in relating the derived values of quantity and quality to income. In the case of each of the equations, the error terms were assumed to have the properties required for unbiased estimation of the means and variances of the coefficients by ordinary least squares. These equations, estimated as prescribed, supply the information required for calculating an estimated income elasticity using the left-hand side of equation (1.4).

Results of the Application

Estimates of the equations which are used in calculating the income elasticities are given, along with values of the associated coefficients of determination, in the following equations[4]:

$$(3.1) \qquad \hat{F} = -\underset{(67)}{1178} + \underset{(65)}{165} \ln X + \underset{(22)}{82} \ln Y \qquad (\overline{R}^2 = 0.74)$$

$$(3.2) \qquad \ln \hat{X} = \underset{(111.37)}{6.74} + \underset{(0.028)}{0.183} \ln I \qquad (\overline{R}^2 = 0.68);$$

$$\ln \hat{Y} = -\underset{(0.03)}{3.15} + \underset{(0.086)}{0.537} \ln I \qquad (\overline{R}^2 = 0.66).$$

$$(3.2') \qquad \hat{X} = -\underset{(3308)}{248} + \underset{(75)}{469} \ln I \qquad (\overline{R}^2 = 0.66);$$

$$\hat{Y} = \underset{(0.256)}{0.560} \quad \underset{(0.0001)}{0.0012}\, I \qquad (\overline{R}^2 = 0.81).$$

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from the United Nations [10, pp. 497–500]. The limitations of the quantity measure are discussed by Helen Farnsworth [2]. Food quality, as used in this paper, refers to palatability and does not necessarily pertain to nutritive value. The starchy staple ratio is an arbitrary measure of quality, but some precedent in the literature exists for its use [1, pp. 213–226].

[3] Under ideal circumstances the estimation of the quantity and quality elasticities could be accomplished without first estimating function (1.1). However, the data limitations here are such that the two-step procedure appeared to be the only alternative.

[4] Equation (3.1) is the counterpart of equation (1.1) in the model, and equations (3.2) and

Equation (3.1) gives the quantity and quality weights used in calculating the income elasticity. Both weights decrease as per capita income increases —the quantity weight from 2.33 to 0.71 and the quality weight from 1.11 to 0.35 as per capita income increases from $159 to $2048. In equations (3.2), the derived quantity and quality components of the food expenditure function are related to per capita income. The two equations give estimates of the constant quantity and quality elasticities of 0.18 and 0.54 respectively. In equations (3.2′), per capita income is related to the components of the food-expenditure function, using equations which give varying elasticities. The semilog function relating quantity to income gives elasticities ranging from 0.22 to 0.14, and the linear function relating quality to income gives elasticities between 0.25 and 0.81. The two sets of quantity and quality elasticities and the weights produce components which are in agreement with the general hypothesis stated at the end of the first section. They also produce income elasticities which compare favorably with those estimated directly, as is evident in Table 1. The derived income elasticity using vari- (3.2′) relate income to the derived quantity and quality variables, using functions which yield constant and variable elasticities, respectively.

Table 1. Estimated income and quantity and quality elasticities for food in 21 countries

Countries	Component weights		Component elasticities[c]		Income elasticities		
	Quantity[a]	Quality[b]	Quantity[c]	Quality[c]	Derived from varying-component elasticities[d]	Derived from constant-component elasticities[e]	Directly computed[f]
Canada	0.71	0.35	0.14	0.81	0.32	0.38	0.35
Sweden	0.75	0.38	.15	.77	0.34	.40	0.38
Australia	0.74	0.37	.15	.76	0.34	.39	0.39
Belgium	0.85	0.42	.15	.74	0.39	.44	0.41
United Kingdom	0.73	0.36	.15	.74	0.32	.38	0.41
Norway	0.82	0.41	.15	.72	0.37	.42	0.42
France	0.87	0.43	.15	.72	0.39	.44	0.43
Denmark	0.70	0.35	.15	.72	0.32	.36	0.43
Netherlands	0.79	0.39	.16	.67	0.35	.39	0.47
Finland	0.90	0.45	.16	.66	0.40	.44	0.49
Austria	0.92	0.46	.16	.64	0.42	.44	0.50
Italy	1.33	0.66	.17	.57	0.59	.60	0.59
Ireland	1.93[g]	0.96[g]	.17	.55	0.87	.86	0.63
South Africa	1.57	0.78	.18	.48	0.71	.66	0.76
Greece	1.29	0.64	.18	.45	0.58	.53	0.83
Japan	1.87[g]	0.94[g]	.18	.45	0.84	.76	0.83
Jamaica	1.33	0.66	.19	.43	0.59	.53	0.89
Panama	1.69	0.84	.20	.38	0.76	.65	1.11
Honduras	2.46	1.23	.21	.28	1.11	.87	2.23
Peru	2.39	1.19	.22	.28	1.08	.84	2.29
Ecuador	2.23	1.11	0.22	0.25	1.00	0.77	3.05

[a] Partial derivative of (3.1) with respect to quantity times I/F.

[b] Partial derivative of (3.1) with respect to quality times I/F.

[c] Computed from equation (3.2′).

[d] The summation of the quantity weight multiplied by the quantity elasticity as given in col. 3 and the quality weight multiplied by the quality elasticity as given in col. 4.

[e] The summation of the product of the quantity weight and the quantity elasticity (0.18) derived from the constant elasticity function (equation 3.2) and the product of the quality weight and the quality elasticity (0.54) derived from the constant elasticity function (equation 3.2).

[f] Elasticities computed from the estimated equation $F = \underset{(15.03)}{-433.73} + \underset{(15.01)}{91.39} \ln I \qquad (\bar{R}^2 = 0.94)$.

[g] Weight derived by using F rather than $\hat{F}$.

able quantity and quality elasticities moves from 0.77 for the low-income country to 0.38 for the high-income country, and the income elasticity using the constant quality and quantity elasticities ranges between 1.11 and 0.32. The directly calculated income elasticity is between 3.05 and 0.35 using the semilog function and is 0.70 using a log-log function.

In general, estimates of the equations seem acceptable. That is, the values for the $\bar{R}^2$'s and the size of the parameters relative to the standard errors suggest statistical significance of both the equations and the relevant individual parameters. Furthermore, the comparative magnitudes of the unweighted quantity and quality elasticities are in line with the general statements made earlier regarding the composition of diets in high- and low-income countries. Estimated income elasticities for the 21 countries in the cross section are included in Table 1.

Conclusions and Implications for Further Research

Given the limitations of the data, the model, and the estimation procedure,[5] the income elasticities for the countries in the sample are within the range of similar estimates for the long-run income elasticity of food at retail made by Stevens [8, p. iv]. Furthermore, the "derived" elasticities appear to be more reasonable than those directly calculated. This is particularly true for the low-income countries.

In the absence of income elasticities for many different kinds of foods, these estimates of the extent to which increased expenditure for food results from an increase in the quantity of food purchased and the extent to which it results from an improvement in the quality of food may be helpful in making policies to achieve more rapid agricultural adjustment during the process of economic development. In view of the significance of these results, it would seem that further research on this topic, including, among other things, the effects of relative prices and income distributions on food expenditures, is warranted.

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Some Behavioral Aspects of Cooperative Bargaining in Agriculture*

JAMES G. YOUDE

BARGAINING power for farmers currently is receiving attention from numerous groups who are concerned about the price and income problems facing U. S. commercial agriculture. In spite of considerable experience with collective bargaining in agriculture, a paucity of information exists on the process by which cooperative bargaining associations attempt to enhance the economic returns of their member producers. This paper explores some of the behavioral aspects of cooperative bargaining in agriculture.

Since the bilateral monopoly model was developed over a century ago, economists have attempted to resolve the bargaining problem by using conventional economic analysis [5]. Game theorists took up the task of developing meaningful bargaining theories in the 1940's [3]. Both approaches contain a major weakness: the implausible assumptions on which they are based. Helmberger and Hoos recently developed a theory of cooperative bargaining in which they identify the boundaries of price and quantity under various market structure assumptions [4, pp. 50–63]. However, none of the existing theories give much insight into the bargaining process as it occurs in the sale of farm products to processors.

Behavioral Theory and the Bargaining Process

Behavioral theory is an inductive approach to the study of "real processes" by which decisions are made in business organizations. As developed by Cyert and March [1], behavioral theory embodies three concepts that are especially relevant to the bargaining process: organizational goals, organizational slack, and organizational expectations.

Organizational goals

An organization is a coalition of individuals. The organization must have goals, but individuals in the organization have conflicting goals. Thus, organization goals take the form of aspiration levels rather than specific maxima or minima, and aspiration levels change in response to experience.

Organizational slack

Organizational slack is the difference between total firm resources and

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JAMES G. YOUDE *is assistant professor of agricultural economics at Oregon State University.*

total payments necessary to keep factors of production in the organization. Within the firm, slack is typically different from zero.[1] Many forms of slack exist, and all members of the organization obtain slack payments at one time or another. However, some parties receive a greater share of organizational slack than do others over the course of time. Dye argues that slack is the source of residual income, and residual income is the key area of bargaining [2].

Organizational expectations

Behavioral theory assumes that an organization reacts to its environment by observing and interpreting relevant information. Expectations are a result of drawing inferences from available information. Therefore, the availability and cost of information play crucial roles in the decision process. Decisions are not based on complete or consistent information about alternatives but on information generated by the organization's search process.

A Model of Organizational Goal Formation

Behavioral theory provides a basis for constructing a partial theory of the bargaining process in agriculture. The model developed here deals with the formation of price goals by a cooperative bargaining association, to be used in negotiating with processors over price.[2] The objective is to develop a positive model with the ability to simulate the bargaining process as it actually occurs in agriculture.

Consider a bargaining association whose membership consists of a substantial number and percentage of all producers of a farm commodity in a given area. The association's primary objective is to increase the economic returns of its member farmers by bargaining for the highest attainable price (and other terms of trade), given the economic, legal, political, and sociological environment in which it operates. The organization deals with several processing firms, but legal constraints require the association to bargain with each processor separately. We assume that the association does not directly control members' production levels but that through contracts it has been given exclusive authority to sell its members' crops. We also assume that bargaining for price occurs before the growing season starts, so that producers have the alternative of not producing the crop. Figure 1 is a schematic diagram of the goal-setting process in the bargaining association.

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[1] In conventional economic theory, slack is assumed to be zero under equilibrium conditions, since all factors are paid according to the value of their marginal products.

[2] Although bargaining associations usually bargain for terms of trade in addition to price—including contract terms, grading, and delivery conditions—these other considerations will not be treated here

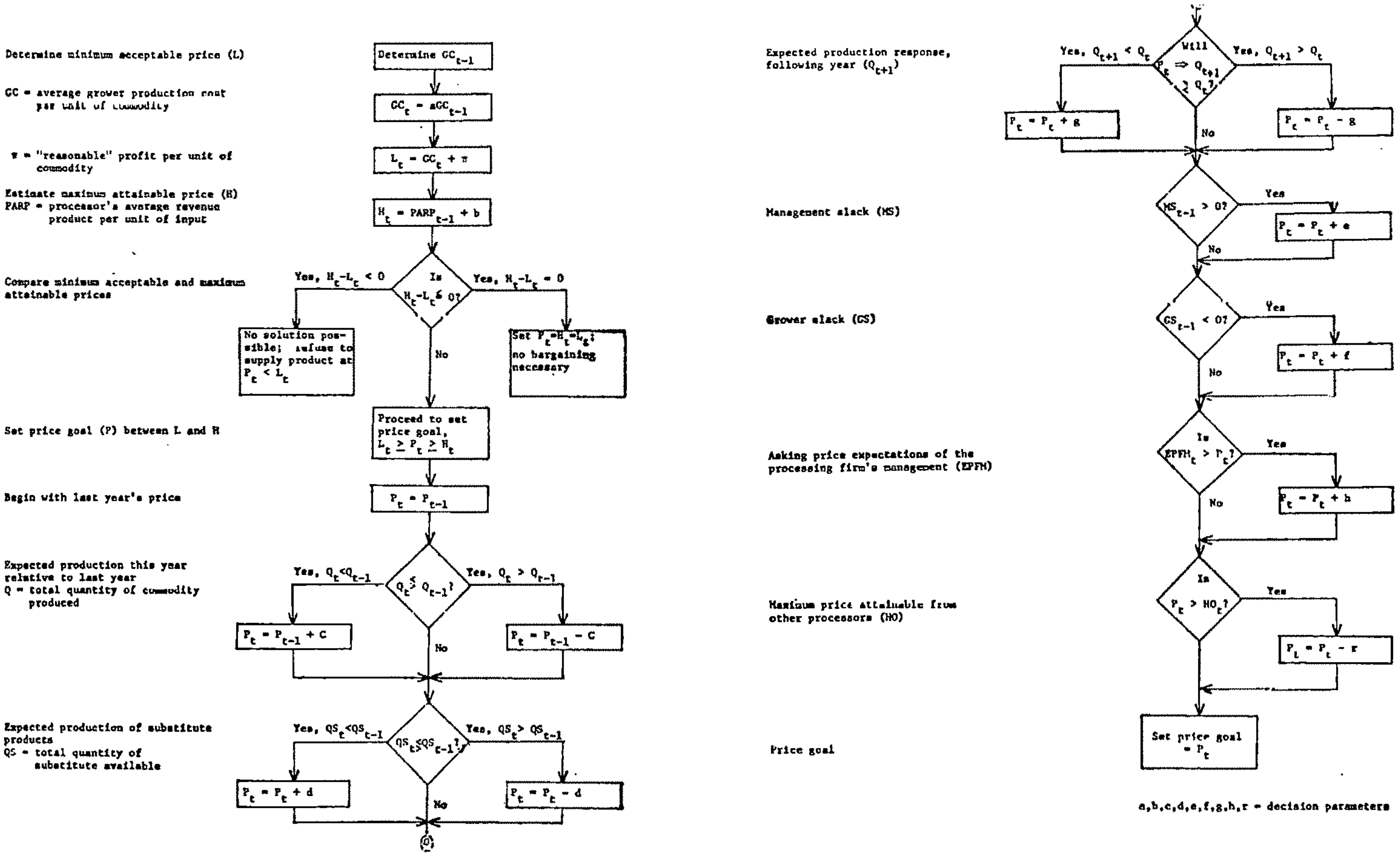
Determine minimum acceptable price (L)
GC = average grower production cost per unit of commodity
π = "reasonable" profit per unit of commodity
Estimate maximum attainable price (H)
PARP = processor's average revenue product per unit of input
Compare minimum acceptable and maximum attainable prices
Set price goal (P) between L and H
Begin with last year's price
Expected production this year relative to last year
Q = total quantity of commodity produced
Expected production of substitute products
QS = total quantity of substitute available
Determine GC_{t-1}
$GC_t = aGC_{t-1}$
$L_t = GC_t + \pi$
$H_t = PARP_{t-1} + b$
Is $H_t - L_t \leq 0$?
Yes, $H_t - L_t < 0$
Yes, $H_t - L_t = 0$
No solution possible; refuse to supply product at $P_t < L_t$
Set $P_t = H_t = L_t$; no bargaining necessary
No
Proceed to set price goal, $L_t \geq P_t \geq H_t$
$P_t = P_{t-1}$
$Q_t \lesseqgtr Q_{t-1}$?
Yes, $Q_t < Q_{t-1}$
Yes, $Q_t > Q_{t-1}$
$P_t = P_{t-1} + C$
$P_t = P_{t-1} - C$
No
$QS_t \lesseqgtr QS_{t-1}$?
Yes, $QS_t < QS_{t-1}$
Yes, $QS_t > QS_{t-1}$
$P_t = P_t + d$
$P_t = P_t - d$
No
Expected production response, following year (Q_{t+1})
Management slack (MS)
Grower slack (GS)
Asking price expectations of the processing firm's management (EPFM)
Maximum price attainable from other processors (HO)
Price goal
Will $P_t \Rightarrow Q_{t+1} \gtrless Q_t$?
Yes, $Q_{t+1} < Q_t$
Yes, $Q_{t+1} > Q_t$
$P_t = P_t + g$
$P_t = P_t - g$
No
$MS_{t-1} > 0$?
Yes
$P_t = P_t + e$
No
$GS_{t-1} < 0$?
Yes
$P_t = P_t + f$
No
Is $EPFM_t > P_t$?
Yes
$P_t = P_t + h$
No
Is $P_t > HO_t$?
Yes
$P_t = P_t - r$
Set price goal $= P_t$
a,b,c,d,e,f,g,h,r = decision parameters

Figure 1. Flow diagram of a behavioral goal-setting model in a cooperative bargaining association

Minimum acceptable and maximum attainable prices

Some minimum price (L) exists below which the association's members will refuse to supply a processor with the commodity. This minimum price can be defined as the member's average unit cost of producing the product, plus some "reasonable" return to his management, labor, and capital. It seems more realistic to base these decisions on average costs than on marginal costs of production. Since the current year's production costs are not yet known, an estimate is made based on last year's costs.

Similarly, there is some maximum price (H) which processors can be expected to pay for the commodity. This maximum can be defined by the processor's average revenue product function, which shows the maximum price a firm can pay for any input and still cover all of its variable costs. Management of the bargaining association will need to estimate this price, based on their knowledge of processing costs during the previous year. It is anticipated that normally there will be some positive difference between H and L, which defines the price-bargaining range. In the absence of this difference, bargaining over price is either impossible or unnecessary.

Setting the price goal

Having identified the above price-bargaining range, the association proceeds to set its price goal (P) within that range. Last year's price serves as a point of departure; it is adjusted upward and/or downward in response to changes in several factors.

Changes in production.—The production levels of both the commodity under consideration (Q) and substitute products (QS) relative to last year are taken into account in establishing a price goal. If the amounts of Q and/or QS produced this year are expected to be less than last year's production, P is increased by some amount. Conversely, if these quantities are expected to increase, P is adjusted downward. Production levels in all relevant competing areas (on both geographic and product bases) are considered in this decision process. In addition, the expected production response of the crop the following year to an increase in price is taken into account by the association. If it is felt that a given price goal will lead to production increases, which in turn will depress prices in succeeding years, the goal will be adjusted accordingly.

Slack and expectations.—Both processing firm management slack (MS) and grower slack (GS) are considered in the goal-setting process. If the processor's operation was very profitable during the previous year (that is, if $MS_{t-1} > 0$), the association revises its price goal upward in an attempt to gain some of this slack during the current season. Similarly, if the association's members had a relatively poor season last year—in that prices received did not cover production costs plus a reasonable profit, so that no grower slack was created—the price goal for the current year will be increased, with the hope of recovering some of the economic gains previously foregone.

In addition, the association attempts to anticipate the expectations of the processing firm's management regarding the price the association will seek in negotiations. If the processor expects a price goal greater than the association thinks is economically warranted, the latter may want to increase its goal. Such a strategy potentially could serve two purposes: (1) it could result in a higher price agreement than would otherwise prevail, or (2) it might allow the processor to "beat down" the association to its original price goal, allowing the former to gain some utility from the bargaining process in this manner. Some of the psychology of the bargaining process is reflected in this particular strategy.

Maximum likely prices attainable from other processors must also be considered in establishing the price goal. If the association suspects that, for some reason, the other processors with whom it deals will not accept its price goal, even if this firm does, it may want to revise its goal downward. Such a strategy may enhance a successful industrywide bargaining effort, as well as prevent loss of face that would occur if the association had to lower the price it had previously agreed upon with the industry leader.

This model should be regarded as partial in that it deals with only one aspect of the complex bargaining process. However, it illustrates the potential usefulness of behavioral theory in analyzing bargaining in agriculture. Several concepts developed by the behavioral theorists—including organizational goals, slack, and expectations—play central roles in the development of our model. In addition, the critical importance of information in the bargaining process becomes obvious upon perusal of the model.

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MACRO MODELS OF U.S. AGRICULTURE

CHAIRMAN: H. O. CARTER, UNIVERSITY OF CALIFORNIA, DAVIS

Predicting Short-Run Aggregate Adjustment to Policy Alternatives

JERRY A. SHARPLES AND W. NEILL SCHALLER

SEVERAL speakers at last year's AFEA meeting underscored the need for production economists to work harder on real-world policy problems [1, 2, 6]. One prescription, offered by Cromarty, was "to construct an aggregative econometric model for agriculture which could be used to forecast changes in production, utilization, and prices of commodities or commodity groups" [2, p. 1488]. Our paper describes some experience with the approach which Cromarty suggested.

In 1964, the Farm Production Economics Division of the Economic Research Service began to develop a "national model" of aggregate production response, to help answer policy questions asked by the Administration and Congress. The specific need was for a systematic framework that would provide timely, short-run estimates of production, resource use, income, and related variables under alternative government farm programs.

Early experience with the national model made it clear that a team effort was needed if useful estimates were to be obtained before policy decisions were made. As a result, a research team was formed within FPED called the Aggregate Production Analysis Team (APAT). We believe that only by locating members of such a team in different producing regions of the country can we hope to add the human judgment that is needed throughout the analytical process. Thus, APAT consists of seven regional analysts and four analysts located in Washington, D.C.[1]

The national model is the first component of a research "system" being developed by APAT. Since this system is an outgrowth of our experience with the national model, we present a description and evaluation of that experience before previewing the rest of the system.

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[1] The seven regional analysts are as follows: Northeast, Glenn A. Zepp, Storrs, Conn.; Southeast, W. C. McArthur, Athens, Ga.; North Central, Gaylord E. Worden, Ames, Iowa. South Central, P. Leo Strickland, Stillwater, Okla.; Great Plains, Thomas A. Miller, Ft. Collins, Colo.; Northwest, LeRoy C. Rude, Pullman, Wash.; and Southwest, Walter W. Pawson, Tucson, Ariz. The four Washington, D.C., analysts are W. Neill Schaller, Fred H. Abel, W. Herbert Brown, and Jerry A. Sharples.

JERRY A. SHARPLES AND W. NEILL SCHALLER *are agricultural economists with the Economic Research Service, USDA.*

The National Model[2]

The model is essentially a crop production model. It consists of about 90 profit-maximizing, linear programming submodels. Each submodel represents the aggregate of resources on a group of farms that are assumed to display similar patterns of production response.

The model assumes that farmers follow the cobweb type of response, in which current production depends on past prices while current production determines current prices. This assumption greatly simplifies our analysis, because once current prices are quantified, we can analyze each submodel independently to obtain estimates of response for the next year. The effects of aggregate output on price are lagged and therefore can be incorporated in the analysis as a subsequent step.

The use of linear programming to generate production estimates in the cobweb setting is an example of the "recursive programming" approach developed by Richard H. Day [4, 8]. The full sequential estimating procedure, in which aggregate output this year determines price expectations for next year, is akin to what Day calls "dynamic coupling" [3]. In our research so far, we have limited our application of this approach to the estimation of response only one year ahead.

In Figure 1, the unshaded areas of the United States are those represented in the current model. The United States is divided into seven regions, with a regional analyst responsible for the research in each one. The regions are divided into production areas. A production area may contain one or more resource situations. For example, a production area may contain resource situations for clay and sandy soil farms; small, medium, and large farms; irrigated and nonirrigated farms—whatever intra-area differences need to be broken out so as to improve area estimates. Since the farms represented by a resource situation need not be contiguous, Figure 1 shows only the regions and areas.

A separate programming submodel is constructed for each resource situation. The submodels are similar to conventional farm models, except that the restraints are expressed in aggregates and a different programming problem is defined for each year to be estimated. Each matrix must meet certain specifications required for national analysis, such as including certain crops and government program variables, but otherwise the matrices are custom-made for the different resource situations.

Short-run profit maximization, subject to physical resource restrictions, though an ingenious mathematical criterion, is of course unattainable by farmers because of lack of knowledge, and it is seldom their only goal. Therefore, to reflect the probable limits on farmers' aggregate response,

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[2] For a more complete description of the background, methodology, and initial testing of the national model, see Schaller [7].

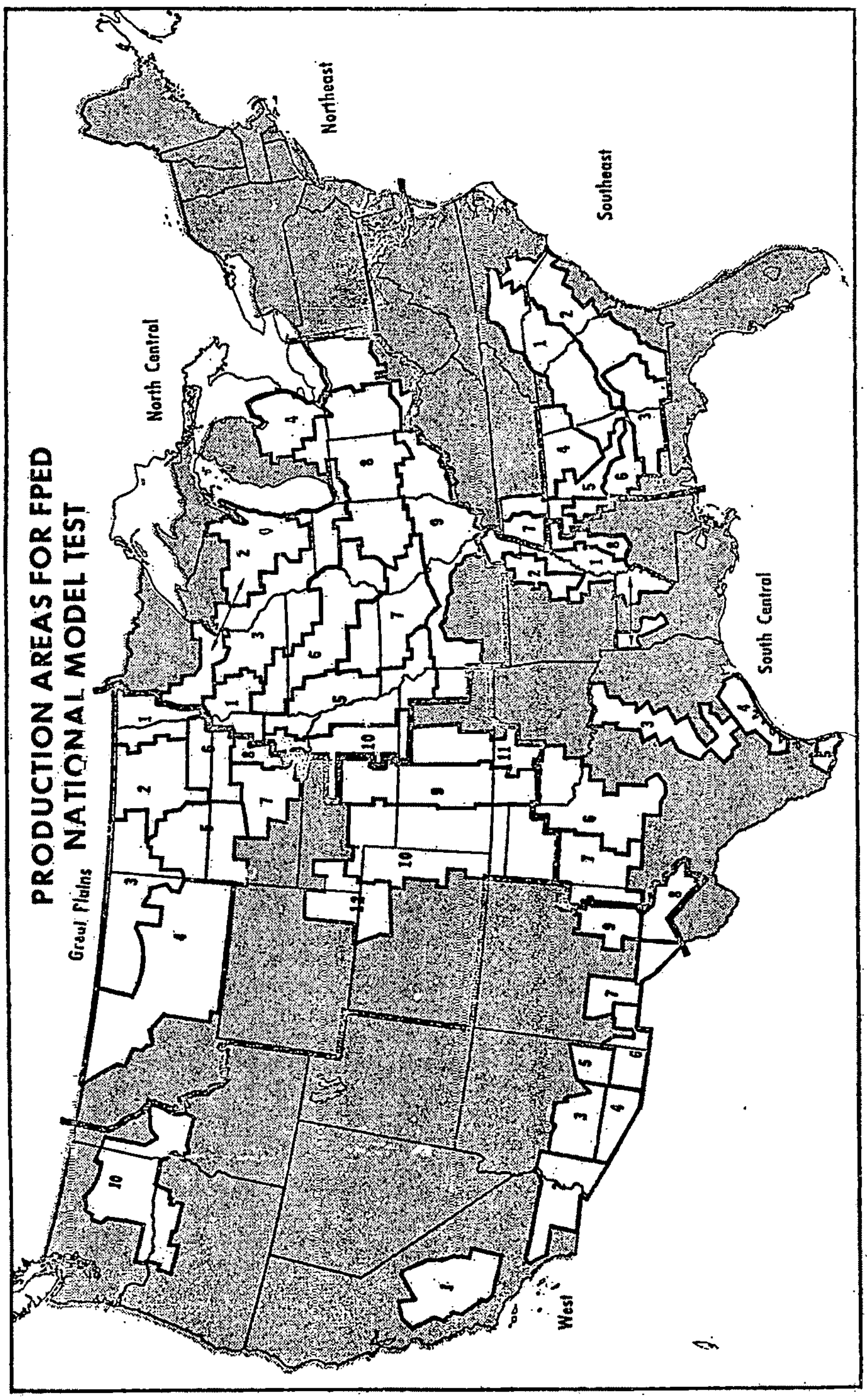
PRODUCTION AREAS FOR FPED
NATIONAL MODEL TEST
Great Plains
North Central
Northeast
Southeast
South Central
West

Figure 1.

each submodel includes various tempering restraints. These may be judgment restraints based, for example, on knowledge that farmers in a given area traditionally fallow at least so much land and that their past participation in voluntary supply programs has always been within a certain range. The most widely used tempering restraints, however, are termed flexibility restraints, or upper and lower bounds on the solution acreage of each crop or group of crops, and in certain cases different methods of producing a given crop.

For a given resource situation the restraints are expressed mathematically as follows:

$$\text{Upper bound: } X_{jt} \leq (1 + \bar{\beta}_j)X_{j,t-1}$$
$$\text{Lower bound: } X_{jt} \geq (1 - \underline{\beta}_j)X_{j,t-1}$$

where

X_{jt} refers to the acreage of the jth crop in the solution for year t (the year being analyzed),

$X_{j,t-1}$ is our best estimate of the actual acreage in the previous year, or other base period, and

$\bar{\beta}_j$ and $\underline{\beta}_j$ are the maximum allowable percentage increase and decrease, respectively, from the acreage in the previous year. The β's are called flexibility coefficients.

The 1968 test

After testing an initial model against actual acreage changes in 1960–1964 [7, pp. 38–43], we undertook a forward analysis of response for the production year 1968. This study was intended as a more realistic test of the model and our operating procedures. We also hoped to be able to contribute information for policy guidance. The model was designed specifically to permit manipulation of the cotton, wheat, and feedgrain program variables that the Secretary of Agriculture could change under the Food and Agriculture Act of 1965.

Our plan was to build a versatile model, one that could be used on short notice to help answer specific questions about the possible effects of higher or lower allotments, diversion payment rates, and price supports in 1968. The APA Team set out, early in 1967, to build such a research capability.

The 1968 model areas accounted for the bulk of U.S. production of the major crops. The activities included various methods of producing these crops as well as enterprises unique to each area, such as livestock, flax, safflower, and hay, which competed for resources or might help estimate major crop response. The options of voluntary participation in major commodity programs were also expressed as activities. The most important physical restraint in the model was cropland. Labor restraints were included in some resource situations, but they proved difficult to quantify in the aggregate. No capital restraints were included. Irrigation water and other restraints unique to certain areas were specified. All situations included flexibility restraints on crop acres and crop diversion, and institutional restraints such as allotments and base acreages.

If the matrices for all resource situations had been combined, the resulting matrix would have involved something like 3,800 equations, or rows, and 2,700 activities. However, the equations included many "count" rows to facilitate the recording of solutions.

We used several methods to estimate flexibility coefficients, because no one method was deemed best for all areas of the country. The methods ranged from a simple averaging of past year-to-year changes to the use of least-squares regression.

The development of the 1968 model started in March 1967. Our goal was to have the model operational by July 1, 1967. We drew heavily on the work previously done for the initial, historical test. Uniform procedures and assumptions were agreed upon and spelled out in a study guide. Data on historical acreages, livestock numbers, allotments, and so forth were collected in Washington, D.C. The regional analysts prepared budgets with the help of other FPED field personnel, developed matrices, and in some cases test-programmed their submodels. Except for pretests, all computing and solution tabulations were done in Washington.

Evaluation of the model

The 1968 model results consist of (1) bench-mark estimates of response, assuming a continuation of 1967 program provisions for cotton, wheat, and feedgrains, and 1968 product price, yield, and cost expectations, (2) estimates of cotton production and diversion under alternative cotton program provisions, and (3) final bench-mark estimates with actual 1968 program provisions substituted for 1967 programs.

The third set of results shows what the model would have said, back in the summer of 1967, if the 1968 program provisions had been known at that time. These results, when compared with actual 1968 response, provide about the only empirical measurement of the model's predictive reliability. The first two results are difficult to evaluate empirically because there is no "actual" for comparison. Few of the original bench-mark conditions or the cotton program provisions assumed in our analysis actually materialized. This is to be expected in forward policy research.

Of course, the comparison of model results with actual response is not the only relevant test. A more meaningful test is often one that asks the question, Does this model provide results that are more reliable than those from alternative models, at the same (or lower) research cost? We know of no estimates from alternative models that would be comparable to the national model results for 1968. Therefore, we will examine selected results mainly in relation to actual response this year. Our discussion is limited to results of the cotton analysis and to some final benchmark estimates.

The cotton analysis.—The cotton analysis was one of many possible model applications. It was undertaken because the need for changes in farm programs became especially critical for cotton during the summer of 1967. The 1967 cotton crop was well below expectation as a result of relatively high diversion and unfavorable weather. Department policy-makers needed to know what adjustments permitted under the Food and Agriculture Act of 1955 would help to correct the situation in 1968.

Because of the need for an early decision by the Administration, we did not have time to contribute programming results to the ensuing study. Rather, one of our Washington analysts, working with others in FPED, used many of the data assembled for the model as an aid in developing informal estimates of probable cotton response to proposed program changes. However, we went on to complete the programming analysis because of its expected value as a dry-run application.[3]

The programming analysis assumed four alternative sets of program provisions: (1) the cotton program as defined in 1967,[4] (2) the 1967 cotton program except that maximum diversion was reduced from 35 percent of a farmer's allotment to 25 percent, (3) the 1967 cotton program but with no mandatory diversion, and (4) the 1967 cotton program with each of six levels of diversion payments. Flexibility restraints were removed from cotton acreage and diversion to examine the last three alternatives. This was done because we believed that the original bounds on planted acreage and diversion would be inconsistent with the proposed changes in the cotton program. Flexibility restraints on other crops were retained but adjusted informally to take account of the likely impact of cotton program changes.

Results from these solutions can be summarized in many ways. We could show, for each area and for the sum of all areas, the acres of each crop planted, expected production of each crop, cost to the government of each of the alternative program proposals, and total acres diverted. But "total cotton acreage" and "total diverted acreage" should give a general idea of how the results changed from one program alternative to another (Table 1).

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[3] The cotton analysis required programming only the Southeast, South Central, and Southwestern submodels. Because the submodels are solved independently to estimate response one year ahead, we could simplify the task by excluding all noncotton regions.

[4] Participants in the 1967 cotton program had to divert at least 12.5 percent of their cotton allotment but could not divert more than 35 percent. A payment of 10.78 cents multiplied by the projected yield was received for each acre of diversion in excess of 12.5 percent. There were additional provisions for farms with small cotton allotments.

The actual 1968 cotton program differs from the 1967 program in two major ways: (1) the diversion payment is 6 cents per pound of projected cotton yield rather than 10.78 cents, and (2) mandatory diversion for participants is 5 percent of the cotton allotment rather than 12.5 percent. None of the alternatives used in the national model contained both of these changes, but the alternative in Table 1, based on a 6-cent diversion payment, comes the closest.

Table 1. National model estimates of 1968 cotton acreage planted and diverted in included areas of the United States under alternative government programs

Program	Planted acres	Diverted acres
	. . . . . thousand	*acres . . . .*
Assuming 1967 cotton program	8,825	3,745
Assuming 1967 cotton program, removing flexibility restraints on cotton and diversion, and having		
25 percent maximum diversion	9,611	2,872
no mandatory diversion	9,486	3,303
diversion payment of (*cents per pound*)		
10.78	9,253	3,561
10.00	9,284	3,493
8.00	9,379	3,047
6.00	9,827	2,375
4.00	10,150	1,928
0	10,270	1,624

According to the July crop report, farmers this year will grow about 11 million acres of cotton and divert 3 million acres of cotton allotment [9]. About 9.8 million of these cotton acres and 2.8 million diverted acres are in areas included in the national model. Comparing these actual acreages with the results shown in Table 1 for the 6-cent diversion rate, we see that the model estimate of cotton acreage is very close to the actual but diversion is underestimated. If the national model results were adjusted to allow for the reduction of mandatory diversion from 12.5 to 5 percent, our estimated cotton acreage would be higher and the diversion estimate lower. Although this adjustment would make the model results slightly less accurate, the estimates would still be in the ballpark. It is impossible to evaluate the other results except to observe that the direction and magnitude of the change from one solution to the next seems reasonable.

The final bench-mark analysis.—Another comparison can be made between model estimates and actual response, using the 1968 model with 1968 program provisions incorporated. This analysis has not been completed for all regions, so only the results obtained for the North Central region will be presented. Preliminary indications are that the accuracy shown for the North Central is representative of the results for other regions.

The model estimates of acres planted to major crops in the North Central are compared in Table 2 with July estimates of actual acres. The model predicts corn, soybeans, wheat, and hay acres with less than a 10-percent error. Oat acres and feedgrain diversion were substantially underestimated.[5] Participation in the feedgrain program was underestimated, resulting in a high corn estimate and a low diversion estimate. As with the cotton analysis, these results are in the ballpark, but there is room for improvement.

Table 2. Comparison of the national model estimates of planted acres with actual planted acres, selected crops, North Central Region, 1968

Crop	National model results	July 1968 estimates	Results as a percentage of July estimates
	1,000 acres		*percent*
Corn	49,589	47,300	105
Soybeans	27,636	25,400	109
Hay	17,328	17,300	100
Feedgrain diversion	13,365	17,200	78
Oats	8,897	10,000[a]	89
Wheat	7,997	8,500	94

[a] Oats planted only for harvest. About 1.5 million additional acres of oats were planted on diverted acres as a cover crop.

The lessons learned.—Several problems were revealed in the 1968 test—some old, some new. The three most important of these concern the role of flexibility restraints, the micro-macro balance, and livestock.

The 1968 test demonstrated the vital role played by flexibility restraints. When the national model was first conceived, we visualized including many physical constraints, such as cropland, labor, capital, irrigation water, and livestock facilities. Flexibility restraints were also to be added as supplementary bounds, to account for forces that the physical restraints could not represent. To make the model work on a national scale, many compromises had to be made with the physical restraints because of lack of data and the need to keep the size of the model within manageable proportions.

Capital restraints were the first to go. We found that it was impossible to define a useful capital restraint for a group of farms. Labor caused almost as many problems. In any group of farms there will be some that have excess labor and others that have a shortage. Some labor will also be used off the farm, or on vegetable crops, poultry, or other enterprises not included in the model. Thus, labor was also omitted as a restraint in many areas. Restraints on livestock facilities had little effect on the results. The small number of data available indicated that in many areas livestock facilities were generally not a limiting factor in the aggregate. More is said about livestock below.

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[5] Other prognosticators have also underestimated oat acreages and feedgrain diversion.

As a result of dropping the capital and labor restraints and having livestock facility restraints that were not binding, cropland was the only major physical restraint in many parts of the country. Consequently, most crops were restrained by flexibility restraints rather than by physical restraints. In a typical solution, the most profitable crops would go to their upper flexibility bounds, the less profitable crops would go to their lower bounds, and one crop would be between the bounds, restrained by total cropland. For example, in the 1968 solutions for the North Central, 45 percent of the crop and livestock activities went to their upper bounds, 42 percent went to their lower bounds, and only 13 percent were between bounds (limited by restraints other than flexibility restraints).

These results show that much thought needs to be put into the estimation of flexibility restraints. With the elimination of most of the real restraints, the model has evolved into a rather naïve linear programming model, with the flexibility restraints playing a dominant role. But this may be a blessing, more than a fault. It is through flexibility restraints (and enterprise budgets) that much of the regional analyst's special knowledge of his region can be incorporated into the model. Indeed, the national model seems to be an effective way to utilize systematically the knowledge of regional agriculture possessed by analysts on the team. The man on the spot is in the best position to add the essential degree of "art" to "science."

The national model is a hybrid, a cross between a micro model and a macro model. During the 1968 test we were continually faced with the problem of balance between the two. A case in point was participation in the feedgrain program. In the national model, one resource situation may represent several thousand farms. The model assumes that all farms in that resource situation will respond in a similar way to economic stimuli: that is, that all farms will either participate in the feedgrain program or not participate—depending on which alternative is more profitable. But in the real world, some farmers will participate and others will not. Our problem is how to build this into the model.

We have two choices: (1) to stratify farms further, into a group that is likely to participate and a group that is not likely to participate, or (2) to add artificial bounds, like flexibility restraints, to prevent an "all or nothing" solution. For example, we might specify, for a given resource situation, that at least 200,000 acres must be diverted from corn production but no more than 300,000 acres can be diverted.

The choice of moving toward more micro detail or toward more macro restraints depends on the availability of data and the time one has to do the research. Stratifying the national model into more resource situations implies more micro data—usually primary data. On the other hand, macro restraints are commonly obtained from secondary data sources.

For the 1968 test, we chose the "macro restraint" route. Upper and lower bounds were placed on both feedgrain diversion and feedgrain production, as well as on cotton diversion and cotton production. Historical acreage levels are logical data on which to base such restraints. But in the case of diversion, a practical problem exists. It is simply that historical participation data are limited or are of dubious value because of major differences in past program provisions. We have yet to resolve this difficulty.

The third problem area centers on livestock. When the model was on the drawing boards, we entertained the hope that it would be a useful device for estimating livestock as well as crop response. This possibility grew dim as the methodology took shape. The year-to-year recursive theory seemed to depict annual crop response, but it was far too simple for livestock decisions.

Livestock activities were included in many area submodels but only to improve our crop estimates. The livestock could do this by competing with crops for labor and some land and by implicitly giving a feed value to silage, hay, and feedgrains. With livestock in the model, no explicit value would have to be assigned to hay and silage—that is, if we assumed that none was imported to or exported from the area. But these two reasons for having livestock in the model turned out to be unimportant. As pointed out above, labor restraints were omitted in most regions because of the difficulty of estimation. We also found that, since we were dealing with year-ahead estimates, we could do a better job of predicting livestock numbers, and consequently feed consumed by livestock, outside the model. Since the 1968 test, livestock have been eliminated from the model and lower bounds placed on the various feed-producing activities. As a consequence, we have no national livestock model.

Evaluation of working procedures

The July 1 deadline for completion of an operational model was not met. We underestimated by two months the time that it would take to set the rules, collect the data, and complete the computing. The fact that 1968 program changes were made before our analysis was complete demonstrated the need for an earlier start and for more efficient procedures. Our assignment was new and the course uncharted. Graduation from historical (ex post) research to forward (ex ante) analysis can be a sobering experience. In our case, it was at the same time an encouraging one. The team spirit that developed, the research experience itself, and the empirical results provided a solid foundation for more timely contributions in the future.

Another important lesson about timeliness came out of the 1968 model experience. We planned that when the model was operational, any proposed adjustment in the programs for cotton, wheat, or feedgrains could be built into the model, computed, and analyzed in a matter of a few weeks. But we found that this was impossible to do for two reasons: (1) Any time a change in any parameter is introduced into the model, many flexibility restraints need to be reestimated. This by itself is a major research job. (2) After solutions are obtained from each of the 90 linear programming submodels, the job of aggregating and interpreting can be staggering. So we concluded that it is unrealistic at present to have a model on the computer, ready for someone to feed in a problem, and to try to turn out properly interpreted results as rapidly as the electronic data-processing people might suggest.

We are now working on an alternative procedure. We are designing the national model specifically to analyze several bench-mark situations early each year. For example, we could have designed the 1968 model to give, say, four sets of estimates, one for each of the following assumptions: (1) a continuation of 1967 farm programs, (2) the same as *1* except that cotton diversion payments would be eliminated, (3) the same as *1* except that the 1966 feedgrain program would be assumed, and (4) the same as *1* except that wheat allotments would be changed by some specified amount. Once summarized and evaluated, analysts could use these four solutions to respond quickly to policy questions on commodity programs. They could do this by extrapolating or interpolating from the bench-mark solutions and taking account of data not included in the original analysis.

This change in our view of the national model has led to a basic change in the research procedure. The original plan of turning out answers to specific questions in a very short time suggested that the model computation and analysis would have to be centered in Washington, D.C. But this meant that the regional analysts could not contribute special knowledge of their regions to the interpretation of the results. Moreover, doing all of the computing at one location created a bottleneck. Since the 1968 study, we have decentralized the national model research. The whole APA Team will be involved in developing the overall research program—specifying the bench-mark solutions to be obtained, the assumptions, and the working procedures. But the regional analysts will design the programming submodels for their resource situations, compute the solutions for each bench mark, and analyze the results. The Washington, D.C., analysts will coordinate the research and analyze the bench-mark solutions at the national level.

The Aggregate Production Analysis System

The main lesson learned from our experience with the national model is that no single model can provide all of the quantitative intelligence about aggregate production response that policy-makers need. The original planners of the national model believed that a general model was needed to bring sophisticated research to bear on policy issues within stringent time limits. The idea of needing only one general policy model now seems unreasonable. Some policy questions are concerned with a 5- to 10-year adjustment process. Others, such as those related to the present commodity programs, are concerned with only a 1-year adjustment process. Some questions may be best answered by using regression analysis, others by using linear programming. It is hard to conceive of a model that could include all these variations.

But we have found that it is possible to do timely policy research on a sophisticated—or formal—level without a general model. The key is readily available data. The time-consuming part of our research is assembling the data, not designing the model. Once the data are handy, specific models can be designed to answer specific questions in a short period of time. We have found that the crop budgets and other aggregate data obtained for the 1968 test are the backbone of our continuing policy research.

As an example, the Division was asked earlier this year to evaluate the possible effects of a general cropland retirement program. James Vermeer and Rudie Slaughter of FPED used the national model budgets and some of the restraints in their own simple model [10]. This study was completed in only 10 weeks—from beginning to publication. The same study would have taken up to a year if the national model data had not been available. Another example is the cotton analysis noted earlier. This analysis also utilized national model data to find break-even diversion payments and associated levels of program participation, without the help of formal programming.

The 1968 test of the national model helped to show that the research capability we need to develop requires an integrated research system that can make maximum use of all available research resources—different models, data, and the technical skills and knowledge of agriculture possessed by the team members. As a result, the members of the APA Team have developed an Aggregate Production Analysis System—APAS for short (Fig. 2).

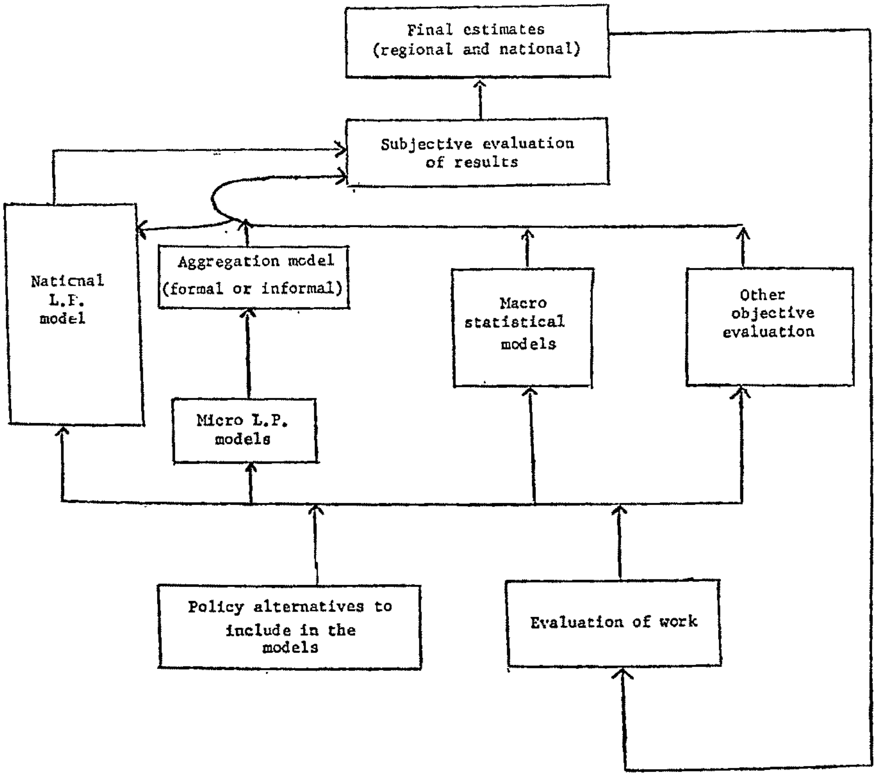
Final estimates (regional and national)
Subjective evaluation of results
National L.P. model
Aggregation model (formal or informal)
Macro statistical models
Other objective evaluation
Micro L.P. models
Policy alternatives to include in the models
Evaluation of work

Figure 2. Aggregate production analysis system

Several aspects of APAS are worth noting. First, as shown in Figure 2, a variety of models may be used for responding to any given policy question. The national LP model is only one of these. Second, the model results are not final results. The researchers must interpret the formal results —evaluate the effects of removing simplifying assumptions of the formal model. This is the box labeled "subjective evaluation of results" shown near the top of Figure 2. And third, the accuracy and usefulness of the results need to be evaluated so that the system can be improved. "Evaluation of work" is a key component of any success the research may enjoy.

Research is now under way on each of the types of models shown in Figure 2. Regression analysis of time-series data is being used in several regions in order to improve estimates of production under alternative policy provisions [5]. We are also evaluating the contribution to policy analysis that can be made by representative farm analysis. A detailed micro analysis would be a difficult approach to timely policy analysis, but a supplementary set of a few representative farm models may be a useful way to point out the effects of micro forces on different kinds of farms.

Plans also call for including livestock in our system of analysis. One possibility is to develop a U.S. statistical model for livestock that can be interfaced with the national model. That is, important feed–livestock relationships might be captured, through an iterative procedure, rather than treated exogenously in each of the two models.

To summarize, we believe that a systems approach to policy research is an efficient way to use the research resources at our disposal. The foundation of the Aggregate Production Analysis System rests on good data and good researchers. The building blocks are various formal and informal models. One general model cannot do the job. The cornerstone is flexibility—flexibility to adjust to the changing policy needs. APAS is a step in this direction.

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Discussion: Predicting Short-Run Aggregate Adjustment to Policy Alternatives

GORDON A. KING*

Efforts to obtain a framework for analyzing the effects of policy changes on acreages of wheat, feedgrains, and cotton must be viewed as first-priority research. The accomplishment of getting a team effort for such analysis, as reported by Sharples and Schaller, deserves the encour-

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GORDON A. KING *is professor of agricultural economics at the University of California, Davis.*

agement of the profession. This is especially true since it is a continuing effort, aimed at providing timely estimates of probable effects of policy change, which will allow improvements to be made on the basis of experience gained as to the strengths and weaknesses of the several approaches suggested.

The primary conclusion I gain from the paper is that the authors wish to place the "recursive programming approach" or the national model in a broader framework of an "aggregate production analysis system." Only preliminary ideas are presented as to the nature of this system, but it is clearly a move from concentration on a single model to one that will allow different approaches depending on the problem at hand. This appears to be a very realistic view. Similarly, the argument is made for side-analyses for certain sectors such as livestock rather than inclusion of all sectors in one model. Commodity demand is not mentioned at all, although I would judge that the authors might well wish to consider a system that explicitly recognized the obvious interdependencies in the analysis of farm programs.

The candid appraisal of the 1968 test of the model in this paper and the review for 1960–1964 by Schaller [2] in *Agricultural Economics Research* provides valuable insights into the practical problems of production forecasting. To review briefly the essentials of the model, production activities appropriate for each of some 90 resource situations are specified, plus options of government programs. The major physical restraint is cropland, although water is specified for irrigated agriculture. An essential difference between this model and the linear model discussed by Hall and Heady is the incorporation of flexibility restraints that limit the adjustment in acreage from one year to the next. This reflects the difference in emphasis between predictive short-run models and normative solutions to alternative policy specifications.

The key role of flexibility restraints has been apparent in previous research using this approach. Estimation of such bounds thus takes a central place in the predictive accuracy of the model. The authors argue for the benefits of "flexible" flexibility restraints, since regional analysts may incorporate insights from various sources in establishing these bounds. I appreciate the importance of taking advantage of the knowledge of both regional and commodity analysts in such predictions. I should hope, however, that the production analysis system will include a feedback mechanism to indicate the reasons for errors in acreage adjustment so that further refinements can be incorporated for future predictions.

Essentially, the flexibility restraints may be considered as *a priori* information imposed on the linear programming problem. The combination of time-series estimates of acreage adjustment and the cross-section data on farm resource situations may be the best predictive device. An alternative procedure might be developed in which major reliance might be placed on econometric models but with programming solutions providing *a priori* restraints as to the level of acreage adjustment under specified conditions. For example, the model might specify supply responses for the major crops by region but with the total acreage planted restrained to a given amount in each region. Programming solutions might then give an indication of the relative shifts in the supply functions due to policy changes, or due to changes in expectations as to shifts in domestic or foreign demand. Perhaps this approach more nearly parallels the suggestion made by Cromarty [1] last year, since his example was the Wharton econometric model rather than a programming model as such. I believe that some combination of cross-section and time-series data is desirable for short-run prediction models, especially where structural changes in policy are involved.

Turning briefly to the suggested production analysis system, it is difficult to react to the proposal until further details are filled in. However, the general idea has a great deal of appeal as a framework for providing economic intelligence on a wide variety of policy questions. It would be of interest to me to know what the authors propose to do on the demand aspects. In cotton, for example, estimation of fiber substitution and trade in raw cotton, finished goods, and semifinished goods is of vital importance in planning production adjustments for the industry. Perhaps this is a subsystem of a larger system to be developed by the Economic Research Service. If so, it would be helpful to note these interdependencies.

Livestock production, it was suggested, could be analyzed as a separate subsystem. However, it would be useful to structure the model to indicate the nature of the national and regional interdependencies. Perhaps research on excluded commodities for the national model might be designed to fit into this general framework, but as side-analyses that would be helpful to regional analysts. Also, research on regional demand estimates may be useful for more comprehensive study of interregional competition.

The paper by Sharples and Schaller opens up interesting possibilities for improved prediction models, and I want again to compliment them and their colleagues on this fine example of cooperative research. I also was much interested in the paper by Heady and Hall, which will be discussed by Dr. Bawden. These researchers advocate larger and more complex models in contrast to the views of Schaller and Sharples.

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Linear and Nonlinear Spatial Models in Agricultural Competition, Land Use, and Production Potential*

EARL O. HEADY AND HARRY H. HALL

AGRICULTURAL ECONOMISTS have a long-standing interest in the analysis of land-use patterns, interregional competition, supply potential, and other spatial aspects of the agricultural industry. The land-use studies of the 1930's [15], studies of interregional competition in the dairy industry in the same decade [11], and the capacity studies during World War II [7] are all early examples of this interest.

Because of lack of data and limited computational capacity, these early studies were unable either to include all relevant competitive products and important producing areas or to incorporate enough simultaneous regional interdependencies. Data deficiencies (both quantitative and qualitative) still impose limitations, but modern computers have eliminated many of the computational restrictions. In the mid-1950's, for example, we had difficulty finding a computer which could solve a problem with only 210 restraints and 310 real variables. Now, thanks to improved computers and decomposition algorithms, a model with 4,000 restraints and 37,000 variables does not exhaust computer capacity. Unfortunately, there has been no comparable improvement in the supply of data.

Although other types of models are used, most spatial models, linear or nonlinear, and most supply-response (representative-farm) models are activity-analysis models. Spatial models use a region as the basic producing unit; supply-response models use an individual (representative or typical) farm. Supply-response models try to predict market supply under a given set of market conditions—ignoring, for the most part, interactions between farms in different regions or, for that matter, between farms in the same region. Spatial models try to take account of interregional competitive forces by explicitly including demand restraints and permitting interregional commodity shipments. Insofar as they are inconsistent with regional effects, individual-farm effects are largely ignored.

In 1955, a supply-response model of the Des Moines milkshed [9, 10] was started in Iowa. About the same time, a spatial model, in which the continental United States was partitioned into 104 producing regions [4], was also begun. Since then, we have continued to cooperate with other states

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EARL O. HEADY *is professor of economics and executive director of the Center for Agricultural and Economic Development at Iowa State University.* HARRY H. HALL *is research associate in the Department of Economics at Iowa State University.*

and the USDA in developing supply-response models. Our major emphasis, however, has been on spatial models. For the remainder of the paper, we discuss spatial activity-analysis models. We first review briefly the evolution of such models. We then examine in some detail a linear spatial model and then a nonlinear one, summarizing some of the results from applications of each. Finally, we discuss some of the weaknesses of such models.

Evolution of Spatial Models

Most spatial models, even today, are single-period models, although Takayama and Judge [14] have shown one method of explicitly incorporating time in some models. The earliest models were linear, with relatively few regions and one, or only a few, commodities. Judge's model of the egg industry [8], for example, partitioned the United States into 12 regions. The Egbert and Heady model [4] partitioned the United States into 104 producing regions, but it included only national demands and only for wheat and feedgrains. These early models (and the later ones as well) have relied heavily on two early papers, one by Samuelson [13], the other by Beckmann and Marschak [1].

As computer capacities increased, models with more regions and more commodities were formulated. Whittlesey and Heady [16], for example, formulated a linear model with 144 producing regions and 31 consuming regions, with demands for food wheat, feedgrains, and soybean oilmeal in each consuming region. A national demand for cotton lint was retained. Transportation activities permitted trading, between consuming regions, of the three products for which regional demands were defined. Brokken and Heady [3] contributed another linear model, one with 157 producing regions and 20 consuming regions, which includes livestock as well as crop products. In a model now in progress, demands for livestock and crop products are retained, and every producing region is partitioned into three farm-size groups, each with different labor, capital, and yield coefficients.

Meanwhile, other developments permitted variations in substance as well as detail. Takayama and Judge [14], with the aid of quadratic programming, formulated a model in which demand was determined endogenously with price-dependent demand equations. In this model, net social payoff is maximized. Plessner and Heady [12] formulated a model in which demand is determined endogenously under competitive equilibrium conditions when producer profit is maximized. This second model, along with an application to the crop sectors of United States agriculture, will be described in the section on nonlinear models. A similar application, which includes both crop and livestock products, is now under way.

These spatial models have been used to provide insight into a variety of subjects including (*a*) the allocation of production and land use in agriculture under competitive equilibrium conditions as compared with that under various land-retirement or marketing-quota programs, (*b*) the costs of alternative government programs, (*c*) the effects of alternative rates of technological change on the distribution of production, (*d*) the effect of various levels of export demand on production allocation and cropland use, and (*e*) the impact of such developments as the St. Lawrence Seaway on production distribution and land use. A linear model was used in a major analysis of production capacity and structure of United States agriculture for the National Advisory Commission on Food and Fiber [6].

Linear Spatial Models

We noted earlier that the producing region is the basic producing unit in spatial models. The distinguishing feature of linear spatial models, however, is the assumption that demand, regional or national, is known. Let us examine a model that has 144 producing regions and 31 consuming regions and includes the major field crops: wheat, corn, oats, barley, grain sorghum, soybeans, and cotton. Each consuming region has a set of demands for wheat, feedgrains (a composite of corn, oats, barley, and grain sorghum) and oilmeals. There is a single, national demand for cotton lint. First, we define the following symbols:

X_{ij} is the acres of the ith crop activity in the jth producing region, $i=1, \cdots, 5$; $j=1, \cdots, 144$ ($i=1$ refers to wheat, $i=2$ to feedgrains, $i=3$ to feedgrain–soybean rotation, $i=4$ to soybeans, $i=5$ to cotton).

c_{ij} is the cost per acre of the ith crop activity in the jth producing region.

L_j is the acres of land available for crop production in the jth producing region.

S_j is the soybean acreage restriction in the jth producing region ($S_j=0.5\ L_j$).

Q_{ij} is the acreage allotment or quota (if any) for the ith crop activity in the jth producing region.

D_{gk} is the demand for the gth commodity in the kth consuming region, $g=1, 2, 3$; $k=1, \cdots, 31$ ($g=1$ refers to wheat, $g=2$ to feed grains, $g=3$ to oilmeals).

D_c is the national demand for cotton lint.

a_{gij} is the yield of the gth commodity per acre of the ith crop activity in the jth producing region (for example, a_{231} is the yield of feedgrains per acre of the feedgrain–soybean rotation in producing region 1).

$Z_{gkk'}$ is the quantity of the gth commodity transported from the kth to the k'th consuming region, $k \neq k'$.

$t_{gkk'}$ is the cost per unit of transporting the gth commodity from the kth to the k'th consuming region.

W_k is the quantity of wheat transferred into feedgrains in the kth consuming region.

s_k is the cost per unit of wheat of transferring wheat into feedgrains in the kth consuming region.

q_k is the quantity of feedgrains per unit of wheat in the kth consuming region.

N_k is the number of producing regions in the kth consuming region.

λ_j is the proportion of the feedgrain–soybean rotation devoted to soybeans in the jth producing region, $0 \leq \lambda_j \leq 1$.

The problem is to minimize

$$(1)\quad f(X_{ij}, W_k, Z_{gkk'}) = \sum_{j=1}^{144}\sum_{i=1}^{5} c_{ij}X_{ij} + \sum_{k=1}^{31} s_k W_k + \sum_{g=1}^{3}\sum\sum_{k\neq k'} t_{gkk'}Z_{gkk'}$$

subject to

$$(2)\quad \sum_{i=1}^{5} X_{ij} \leq L_j \qquad (j = 1, \cdots, 144),$$

$$(3)\quad \lambda_j X_{3j} + X_{4j} \leq S_j,$$

$$(4)\quad X_{ij} \leq Q_{ij},$$

$$(5)\quad \sum_{j=1}^{N_k} a_{11j}X_{1j} - W_k + \sum_{k\neq k'} (Z_{1k'k} - Z_{1kk'}) \geq D_{1k} \qquad (k = 1, \cdots, 31),$$

$$(6)\quad \sum_{j=1}^{N_k} a_{22j}X_{2j} + \sum_{j=1}^{N_k} a_{23j}X_{3j} + q_k W_k + \sum_{k\neq k'} (Z_{2k'k} - Z_{2kk'}) \geq D_{2k} \qquad (k = 1, \cdots, 31),$$

$$(7)\quad \sum_{j=1}^{N_k} a_{33j}X_{3j} + \sum_{j=1}^{N_k} a_{34j}X_{4j} + \sum_{k\neq k'} (Z_{3k'k} - Z_{3kk'}) \geq D_{3k} \qquad (k = 1, \cdots, 31),$$

$$(8)\quad \sum_{j=1}^{144} a_{cj}X_{5j} \geq D_c, \quad \text{and}$$

$$(9)\quad X_{ij}, W_k, Z_{gkk'} \geq 0.$$

The constraints have the following interpretations: constraints (2)–(4) require that physical, agronomic, and institutional production limits not be exceeded; (5)–(7) require that, for every consuming region, production plus net shipments from other regions be at least as great as demand; (8) requires that total production of cotton be at least as great as national demand; (9) are the usual nonnegativity requirements. Although the model is a simple one, its solution provides a vast amount of information on the distribution of crop production, the quantity and location of unused cropland, the patterns of interregional commodity shipments and the quantities shipped, and the shadow prices for land and other resources. This was basically the model used in the Food and Fiber Commission study [6]. We now summarize a few results from that study.

In the Food and Fiber study, domestic demands and technical crop coefficients were projected to 1980. Four levels of export demands for 1980 were considered: (*a*) the 1965-66 levels, (*b*) projections of the 1950–1965 trends to 1980 (roughly 3 times the 1966 levels), (*c*) projected commercial market levels only, and (*d*) exports as large as allowed by 1980 production capacity. Four alternative government programs were examined: (*a*) no production controls (with output equal to domestic demand plus, alternately, each of the four export levels); (*b*) the same except for cotton quotas, which were at their 1950–1960 levels; (*c*) land retirement programs similar to those for feedgrains and wheat in 1966, with the land retirement pattern determined so as to minimize total costs (production plus transportation plus program-participation costs); (*d*) mandatory acreage quotas in each producing region.

With no controls and with exports at the 1965-66 levels, 78 million acres of unused cropland were indicated for 1980. With trend-level exports, 47 million acres of unused cropland were indicated. With trend-level exports and acreage quotas enforced in all producing regions, there were still 38 million acres of unused cropland. If all available land were used for production, 2.1 billion bushels of wheat, 70 million tons of feedgrains and 37 million tons of oilmeals would be available for export, after satisfying domestic demands. By comparison, only 2.0 billion bushels of wheat were traded in international markets in 1966. Moreover, in 1965, the United States exported only 742 million bushels of wheat and 23.6 million tons of feedgrains. Thus, according to this analysis, there is likely to be no stress on our agricultural productive capacity until after 1980, at least.

Nonlinear Spatial Models

Many questions about potential productive capacity, land-use patterns, and interregional commodity shipments can be handled satisfactorily with linear models of the type just described. By parametrically varying demand levels, such linear models can be made even more flexible. They can be used to determine demand and supply simultaneously, however, only at the expense of very laborious iterative procedures.

If demand can be accurately reflected with linear demand functions, and if estimates of such functions are available, a quadratic programming model is more efficient for treating demand and supply simultaneously. In the quadratic models formulated by Takayama and Judge [14] and by Plessner and Heady [12], other extensions are possible. For example, both show how to incorporate interregional trade of input factors In a further extension, Takayama and Judge discuss allocation over the course of time as well as space. In this section, we describe a specialization of the Plessner–Heady model and summarize the results from an application of it.

Mathematical model

The model has K consuming regions, each subdivided into H producing regions, and symbols with these definitions:

b^{hk} is an m-vector of primary resources (land) for producing region h in consuming region k $(h=1, \cdots, H; k=1, \cdots, K)$.
x^{hk} is an n-vector of output levels for producing region h in consuming region k.
A^{hk} is a technology matrix relating b^{hk} to a unit of x^{hk}.
p^k is an n-vector of prices for the elements of x^{hk}.
c^{hk} is an n-vector of costs associated with x^{hk}.
u^{hk} is an m-vector of imputed values of the primary resources, b^{hk}.
s^{jk} is an n-vector of shipments from market j to market k $(j \neq k)$.
t^{jk} is an n-vector of costs associated with s^{jk}.

The variables are x^{hk}, p^k, u^{hk}, and s^{jk}. Finally, we assume a linear demand system given by

$$d^k = d_o^k + D^k p^k \qquad (k = 1, \cdots, K), \tag{10}$$

where

d^k is an n-vector of quantities demanded,
d_o^k is an n-vector of constants, and
D^k is a negative semidefinite matrix of constants.

The objective is to maximize

$$f(x^{hk}, p^k, u^{hk}, s^{jk}) = \sum_{k=1}^{K} \left((d_o^k + D^k p^k)' p^k - \sum_{h=1}^{H} c^{hk} x^{hk} - \sum_{h=1}^{H} u^{hk} b^{hk} \right) - \sum_{j \neq k} \sum t^{jk} s^{jk}, \tag{11}$$

subject to

$$A^{hk} x^{hk} \leq b^{hk}, \tag{12}$$

$$p^k - (A^{hk})' u^{hk} \leq c^{hk}, \tag{13}$$

$$D^k p^k - \sum_{j \neq k} (s^{jk} - s^{kj}) - \sum_{h=1}^{H} x^{hk} \leq - d_o^k, \tag{14}$$

$$p^j - p^k \leq t^{kj}, \tag{15}$$

$$p^k - p^j \leq t^{jk} = t^{kj}, \text{ and} \tag{16}$$

$$x^{hk}, p^k, u^{hk}, s^{jk} \geq 0. \tag{17}$$

The objective function (11) is a net profit function, since it represents the residual left after subtracting production costs, land rents, and transportation costs from total revenue. The constraints have these interpretations: (12) insures that land use does not exceed the supply; (13) requires that marginal returns from any activity be no greater than marginal cost (c^{hk} a constant); (14) requires that supply (production plus net imports) be at least as great as demand for every consuming region; (15) and (16) are Samuelson's conditions for equilibrium in trade [13].

Plessner and Heady [12] have shown that, if $\bar{f}=f(\bar{x}^{hk}, \bar{p}^k, \bar{u}^{hk}, \bar{s}^{jk})$ is the optimal value of the objective function, the solution has the following characteristics: (*a*) $\bar{f}=0$ (that is, aggregate net profits are zero); (*b*) if all producing regions in the *k*th consuming region face the prices $\bar{p}^k$, net profits for each producing region are also maximum and zero; (*c*) for every product with positive output, marginal cost equals price; (*d*) for every product with positive price, supply equals demand; (*e*) trade equilibrium conditions are satisfied as equalities for every product actually traded. The characteristics provide a competitive equilibrium solution for the crop sector. It is a heavily restricted equilibrium, however, since the farm sector is treated in isolation from the rest of the economy. One consequence of this isolated treatment is that the land available to agriculture probably does not reflect a price-guided allocation. In the absence of alternative uses for land, estimated quantities are expected to be large, and estimated prices correspondingly low.

An application

The continental United States was partitioned into nine consuming regions. For each region, a system of six linear farm-level demand equations (one each for wheat, corn, oats, and barley for food use, one for feedgrains, and one for oilmeals) in the form of (10) were defined. The demand equations were derived from Brandow's farm-level demand equations [2], adjusted for 1965 population and incomes. Commercial exports for 1965 were apportioned among consuming regions from which foreign shipments are made and were added to the demand intercepts ($d_o{}^k$). Transportation activities permitted trading between consuming regions.

There were 144 producing regions, each contained in one of the nine consuming regions. There were seven potential crop activities in each producing region: wheat, corn, oats, and barley for food use, feedgrains, wheat for feed use, and soybeans. Each region had two land restraints, one for cropland (total cropland less cotton land) and one for soybean land. In its final form, the model included 927 crop production activities, 249 land restraints (144 cropland and 105 soybean land), 54 price variables (6 in each of 9 regions), and 79 transportation activities. The order of the programming matrix was 2672×2672.

Results

Estimated national quantities and national average prices are compared with their actual 1965 market counterparts in Table 1. Estimated prices are substantially lower than actual 1965 prices. Such a relationship was expected, since (*a*) 1965 market prices were strongly influenced by price-support programs and (*b*) estimated prices are short-run prices since the cost coefficients (c^{ik}) do not include fixed costs. Not all estimated quantities are greater than actual quantities, however. The most notable exceptions are for corn and oats. A partial explanation is that since 1957, Brandow's base period, the rates of increase in the use of corn (especially wet-process products) and oats (especially breakfast food uses) have been greater than those indicated by Brandow's trend terms.

Table 1. Estimated U.S. prices and demand quantities and actual 1965 prices and utilization

	Estimated		Actual	
	Price[a]	Quantity[b]	Price[c]	Quantity[b]
	dollars	*millions*	*dollars*	*millions*
Wheat for food (bu.)	0.74	798.74	1.35[d]	796.50
Corn for food (bu.)	0.63	285.86	1.16	332.00
Oats for food (bu.)	0.33	43.22	0.62	47.00
Barley for food (bu.)	0.57	5.96	1.02	6.00
Feed grains (ton)	22.49	172.27	40.62	148.77
Soybean oilmeal (ton)	43.98	21.42	65.41	13.45

[a] Weighted average of estimated regional prices with regional production as weights.
[b] Includes commercial exports.
[c] Seasonal average price received by farmers. Sources: U. S. Department of Agriculture, (*a*) *Fats and Oils Situation,* Sept. 1967; (*b*) *Feed Situation,* Feb. 1967 and Aug. 1967.
[d] Participants in the government wheat program received an average additional $0.44 in the form of wheat certificate payments.

In deriving land restraints, land to produce enough cotton to satisfy 1965 domestic and export uses was first deducted since cotton was not included in the model. Roughly 230 million acres remained for the production of crops included in the model. Under the conditions of the model, roughly 189 million acres were used, and 41 million acres remained idle (were available for producing grass or trees, or for other uses). Many of the earlier linear models indicate about 50 million acres of idle cropland after satisfying domestic and export demands. A more complete discussion of results, including the regional aspects, and the derivation of the data is available in Hall, Heady, and Plessner [5].

Qualifications

Several difficulties must be resolved before quadratic programming models of the type discussed here can be used to formulate and evaluate farm policies. For example, how critical is it if estimated prices differ substantially from those used to make the basic elasticity estimates? Our estimated prices are substantially lower than the prices Brandow used to derive demand slopes from his elasticity coefficients. Were we to calculate elasticities for our estimated prices and quantities, we would expect smaller values than Brandow found. We might put the question another way: Which is the more reasonable assumption, constant demand slopes or constant elasticities? A second question: How do we obtain "reasonable" farm-level elasticity estimates in the first place? This is partly a statistical question, but as Brandow points out [2, p. 10], rigorous statistical estimation has its limitations. Third, how should exports be handled and what constitutes an acceptable set of intercept values (d_o^k)? We ignored these difficulties, for the most part, by accepting available demand estimates, modifying them to the extent of including exports.

Another difficulty with our model, perhaps less critical than the previous ones, is that it includes only crops. We have under way a model that includes both livestock and crops, but it does not deal with the other difficulties. Some problems with quadratic models are the same as for linear models, and we comment on a few of these in our concluding remarks.

Concluding Remarks

Spatial models of the type described here have several shortcomings. Some of these shortcomings are inherent in programming models; some are the result of inadequate data supplies or computer capacities. Both the linear and nonlinear models postulate a linearly homogeneous production function. To the extent that such a production function is a distortion of reality, it is an inherent weakness of these models. We note in passing, however, that supply-response models make the same assumption.

Spatial models also assume complete resource mobility among farms in a given region. This assumption is obviously inconsistent with short-run equilibrium. As we incorporate more regions, the distortion is reduced. But, for the moment at least, it is physically impossible to include every farm, each as a separate region, as it were. A distinct advantage of supply-response models is that, by their very nature, they include resource immobilities between farms.

With such a catalog of shortcomings, why should spatial models be used at all? One strong feature of such models is that they examine, explicitly, the interaction (or competition) between different regions or markets. For this reason, they are useful for examining the differential effects (between markets), for example, of various policy proposals, technological changes, or shifts in demand (domestic or export). A second useful feature of spatial models is that they incorporate both the demand and the supply sides of the market. The treatment of demand in linear spatial models is, to be sure, somewhat naïve but, depending on the purpose of the analysis, perhaps better than no treatment at all. Although it is possible to incorporate many short-run restraints in spatial models, aspects of a longer-run nature are usually emphasized more.

Ultimately, it may be possible to combine in one model the essential characteristics of both spatial and supply-response models—endogenously determined demand and regional interdependencies from the first and short-run mobility restraints from the second. The prospect is almost upon us.

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Discussion: Macro Models of U.S. Agriculture

D. Lee Bawden

The paper by Heady and Hall may be divided into three parts: 25 percent of the space is devoted to an introduction and brief enumeration of past spatial studies; 70 percent is allotted to a brief synopsis of two previous studies which Heady has co-authored; and 5 percent (the last three paragraphs) is devoted to a comparison of various types of models. Let me limit my comments to this last 5 percent.

They indicate that the usual representative-farm programming models can more accurately reflect short-run resource immobilities than can regional spatial models because the latter assume complete resource mobility among farms in a given region. They suggest that the prospect of combining in a single model the essential characteristics of both regional and typical-farm models "is almost upon us" but leave us in suspense regarding how this might be done.

Fortunately, we are not left in suspense very long because Sharples and Schaller claim that they have provided a partial solution to the aggregation problem by using flexibility restraints. However, their concern is with aggregation at a different level: response of an entire region treated as one producing unit vs. individual farm response.

So there are really four levels of aggregation involved—all farms in a region treated individually, several farms representative of many others not appearing in the model, one typical or average farm representing all farms in a region, and a region treated as one large farm.

If the gap between individual-farm models and regional models can be partially bridged by the use of flexibility restraints, this same technique should be useful in bridging Heady and Hall's gap between representative-farm models and regional models.

I will, therefore, confine the remainder of my remarks to the use of flexibility restraints in the Sharples–Schaller model.

First, let me say that I am not a strong proponent of using linear programming for positive, short-run supply response predictions. The difference between what profit maximizers should do and what farmers actually do is fairly large, and to my knowledge there have been few successes in predicting short-run supply within a linear programming framework. However, I do see considerable promise in this area with the use of *sophisticated* flexibility restraints. Although Sharples and Schaller do use flexibility restraints, I would call theirs *naïve* flexibility restraints.

D. Lee Bawden *is associate professor of economics and agricultural economics at the University of Wisconsin.*

Unless adjusted to reflect individual judgment or conditions peculiar to a specific region, their restraints are "the average of actual percentage changes since 1957, plus a standard deviation [W. Neill Schaller, "A National Model of Agricultural Production Response," *Agr. Econ. Res.* 20:33–46, April 1968, p. 40]. In other words, crop acreage cannot increase or decrease by more than 167 percent of the *average* absolute change in the past. The economics of this assumption escapes me.

Furthermore, this limitation is independent of the production level of the previous year in relation to prior production. If last year's production was unusually high, the lower restraint allows the same percentage decrease as if production last year had been at an all-time low. This seems to be unrealistic.

Perhaps the naïveté of the flexibility restraints would not be so serious if they did not assume such importance in the model. Sharples and Schaller indicated that in a typical solution all crops except one are on either the upper or the lower flexibility bounds. In other words, the probability of a crop's being anything other than plus or minus 167 percent of its average historical change is very small.

How then might flexibility restraints in such a model be made more sophisticated?

Farmers do not maximize profits in a given year for a number of reasons: they are profit-motivated but may satisfice or maximin or use some criterion other then profit maximization; they have other goals which sometimes conflict with profit maximization, for example, size of operation; they view future prices, weather, etc., in a probability sense; they are almost totally ignorant of future prices, weather, etc.; or their response to any change is dampened by inertia.

Flexibility restraints of the type used in the national model attempt explicitly to capture only one of these—inertia. A first step to more sophisticated restraints would be to reflect how farmers have responded in the past to changes in relevant variables.[1]

Take price, for example. Suppose that farmers ought to increase production of some crop by 8 percent in response to a 10-percent change in product price but that regression analysis of time-series data shows that they make only a 4-percent response. Would it not be preferable to base flexibility restraints on this rather than on some index of farmers' average response in the past, independent of past or present price changes? The use of regression analysis to estimate flexibility restraints which might then be made endogenous to the model would seem to offer some promise. And this is especially so when the model treats farms at some level of aggregation, as all regional and national models must, for it may be possible to estimate historical producer response to certain variables at the same level of aggregation as the model itself. This would help alleviate the problem cited by Heady and Hall of recognizing short-run resource immobilities among farms in a regional model.

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[1] This may be what Schaller is suggesting in footnote 9 of the article previously referred to.

One final comment. Many of us have followed the progress of the FPED national model with more than passing interest. The project is unique in several ways, and I believe that the Division is to be commended for undertaking such a study and for the progress it has made to date. I would question one statement made by Sharples and Schaller, however—that "the time-consuming part of our research is assembling the data, not designing the model." I wonder if, at this stage in their research, more time spent redesigning the model wouldn't be more fruitful.

THE CHANGING FINANCIAL STRUCTURE OF COMMERCIAL AGRICULTURE

CHAIRMAN: JOHN BRAKE, MICHIGAN STATE UNIVERSITY

Changes in the Financial Structure of the Farm Sector and the Implications for Research*

JOHN E. LEE, JR.

FOR the past two decades the big story in commercial agriculture has been that of dramatic technological change. That change promises to continue, but adjustment to rapid change has really become a part of "normalcy" in farming. Unobtrusively, but as certainly as the technological changes, changes have taken place in the business and financial organization of farm production. The possibilities for further change are profound. These changes threaten to alter traditional patterns of resource ownership and use, distribution of income from farming, traditional roles of farmers, and even the traditional image of farming. The changes that are taking place are reflected in the uneasiness of the "agricultural establishment" and by the attempts of the various groups within that establishment to "find themselves" and identify their roles in today's integrated economy. It is crucial, therefore, to identify the underlying causes of changes that are taking place in farming and to clarify the rationale and implications of those changes.

Thus, the first purpose of this paper is to identify changes in the financial structure of commercial farming—the changes related to control and management of financial resources and services. The second is to evaluate the implications of these changes for research.

The Meaning of Financial Structure

The term "structure" is frequently used but less frequently understood. Though in this paper the term will be used rather broadly, it will be useful to discuss what is included.

The financial structure of agriculture depends in part on what we mean

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* This paper is really a summary report of discussions among my colleagues in the Farm Production Economics Division, ERS, where several study groups recently undertook a review of research in agricultural finance. I am indebted to all who participated in the review. In addition, Don Bostwick, Kenneth Krause, Gordon Rodewald, and Allen Smith reviewed this paper and made useful suggestions. The errors remain my own. Views expressed are my own and do not necessarily represent the views of the U.S. Department of Agriculture.

JOHN E. LEE, JR., *is an agricultural economist in the Economic Research Service, USDA.*

by agricultural finance. Traditionally, and perhaps still too often, agricultural finance has been viewed pretty much in terms of credit—the supply of and demand for borrowed funds. This included, at the micro level, study of how much credit to use and, at the aggregate level, the supply of funds and the processes and institutions of intermediation. But new and innovative things are going on outside the domain of institutional credit and these too are properly the concern of agricultural finance. Let me postpone elaboration on this point and simply assert that agricultural finance pertains to the provision of the services of financial resources to the agricultural sector and to the management of those services to achieve objectives, both micro and macro.

Financial structure relates to the patterns of ownership of financial resources, the institutions and mechanisms for getting the services of those resources from owners to users, the economic, institutional, and technological framework within which financial decisions are made at the firm level, and finally, the market forces which affect the supply of financial resources and which determine the allocation of total income among owners and users of financial resources.

The resources we are talking about are money and nonmoney capital such as land, machinery and equipment, livestock, and production supplies. All except money have physical dimensions, but for purposes of this paper only their value dimensions are relevant. That is, financial decisions are involved in the acquisition of the services of these resources.

The need to understand changes in the financial structure of agriculture stems from more than academic curiosity. We need this information in order (1) to determine the impact of change on people, on institutions, and on the effectiveness of producing the nation's food and fiber, and (2) to design policies, institutions, legislation, and educational programs which will assist society as a whole, as well as the groups directly involved, to capitalize on the opportunities presented by change.

Changes in the Financial Structure of Agriculture

The underlying basis for structural change

Underlying the changes in the financial structure of agriculture have been dramatic advances in the technology of production. In the context of today's industrial society, "technology means the systematic application of scientific or other organized knowledge to practical tasks. Its most important consequence; at least for purposes of economics, is in forcing the division and subdivision of any such tasks into its component parts" [6, p. 12]. In other words, technological change is accompanied by specialization.

In farming, technology has permitted and encouraged the separation of what were once intermediate production steps into separate specialized activities. The farmer once had to produce the animal power and the feed (fuel) for it in order to produce the hay and corn to feed cows which produced beef and milk, much of which was then consumed by the farm family.

Today many farms specialize in only one, or two, or three commodities. But specialization has taken place along other than commodity lines. It has permitted the separation of the stages of production and even of the processes involved in producing a given product. Today the trend is towards having the intermediate services and products supplied by specialists, many of them based off the farm. The services and products furnished by specialists include not only feed, seed, fertilizer, and chemicals, but also technical information, management services, land services (through rental), machine services (through machine leasing), and even custom performance of the farming operations themselves [9, p. 8]. In short, the farmer has found it expedient to specialize in putting resource services together to produce agricultural products and to transfer many of his other traditional activities to other specialists. The process continues.

The limits to the financial structure and organization of agriculture are defined by technical possibilities. In general, the greater the division of labor and specialization permitted by technological progress, the greater the flexibility in putting the pieces together to constitute financial structure.

The increasing division of labor which results in nonfarm specialists' doing things once thought to be an inherent part of farming is confusing to some who now find it difficult to "identify" farmers. Viewed properly, however, these changes permit us to strip away the veneer of subsidiary roles which farmers have traditionally played and to define what is, and always has been, the central role of farmers and the meaning of farming. Farming is the bringing together of resource services for the production of farm commodities. The farmer is simply the agent for that process. He may choose or even be forced to perform related roles; but those roles are not farming.

Indications of structural change

What are some indications that changes in the financial structure of agriculture are indeed taking place? The first measure, recognized by most observers of the farm scene, is the greatly increased capital intensity of farming. Although the physical size of the aggregate farm production plant, in terms of land at least, has remained fairly constant, there has been continuing substitution of indirect labor in the form of tractors, milking parlors, and other capital goods, for direct labor. That, after all, is the meaning of technological development. This substitution is partly reflected in the fact that the value of machinery and motor vehicles used in farming increased from \$3.8 billion in 1940 to over \$24 billion in 1967, whereas during the same period the total number of farmworkers declined from 11 million to 5 million [10].

The increased capital intensity of farming is also reflected in the USDA *Balance Sheet of Agriculture* estimates of the value of assets used for farming and the debts against those assets. Between 1960 and 1968, the value of assets rose by nearly 40 percent, while debt rose more than 103 percent. The debt was the equivalent of only 18 percent of the market value of assets in 1968, but this figure has increased from 12 percent in 1960 [10]. Changes between January 1, 1967, and January 1, 1968, indicate that debts are currently increasing about twice as fast as the value of assets.[1] In terms of current dollars, the equities of farmers and others in farm assets continues to increase, but most, if not all, of that increase can be attributed to increased market values of land.

Much of the increase in farm debt is the result of the continuing consolidation and recombination of existing farm units into fewer and larger units, along with the related restructuring of complements of machinery and other capital. Thus, not all the debt increase represents net additions to the farm production plant.

Not all the farm assets and debts against them are owned by farmers. As farmers specialize more in putting resource services together to produce food and fiber, they are leaving more of the ownership and investment functions to other specialists. Through renting, leasing, custom services, and vertical integration, farmers are acquiring access to the services of land, machinery, and even livestock owned by others. Even the rapid increase in use of borrowed funds reflects increased willingness by farmers to make money with money owned by others and to let others hold more of the investment in farm assets.

The growing separation of use and ownership is reflected in the trend in farm tenure toward part ownership.[2] One-fourth of our farmers are part owners, but they operate over half of the land in farms and rent 60 percent of the land under lease. One-half of the farmers in the United States are full owners, but they operate little more than one-fourth of the land. In some parts of the country, part owners, that is farmers who own part of their land and rent additional land, are the rule rather than the exception. They are also frequently the more aggressive farmers. In 1964, only 7 percent of full owners had farms with sales of \$20,000 or more (the two top economic classes as the census defines them). At the same time, 24 percent of the part owners and 16 percent of the tenants were in the top two economic classes.

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[1] Based on preliminary data for *The Balance Sheet of Agriculture, 1968* (forthcoming).

[2] The decline in tenancy per se is misleading. The decline may be closely related to the demise of the southern cropper, who was really a hired laborer paid in kind. The important point is that full owners operate a declining portion of the land in farms and produce a declining portion of total farm production.

The separation of resource ownership and use has other implications for the financial structure of farming. The availability of resource services, including those of money, owned by others permits a farmer to increase the leverage of his own resources and grow more rapidly than would otherwise be possible. That farmers are already aware of this is indicated in the tenure and debt figures previously cited. It is possible that this increased growth leverage will mean even fewer and larger farm operating units. It may also mean that for a given number and size of units, farmers may choose to hold a smaller equity in farm assets. But it does not necessarily imply increased concentration of land ownership.

The separation of what were once intermediate production steps into specialized activities has resulted in a distinction between the essentially land-based as opposed to nonland-based or land-intensive farming operations. These correspond roughly to crop enterprises on the one hand and livestock and livestock products on the other. Except for range livestock operations, most livestock activities no longer need to be extensively land-based. Broiler and egg production, beef feedlots, pig parlors, and specialized dairy operations are cases in point. If these production enterprises are not land-based but require the use of large amounts of capital and skilled management, they lose their farming image and become less and less distinguishable from nonfarm industrial activities.

The Implications for Research

What do these changes and possibilities of new developments mean for farmers? for policy-makers? for various farmer-related groups? To attempt to answer these questions is to indicate the kinds of research we need. For want of a better categorization, let me suggest that the major agricultural finance research needs which follow from the kinds of changes taking place in farming fall into four broad groups: (1) farm firm finance, (2) the financial structure and organization of the farm production sector, (3) the supply, demand, and markets for farm capital, including credit, and (4) the income structure of the farm sector and the financial status of farmers. Permit me to discuss each group briefly.

Farm firm finance

It is appropriate to start with the firm because changes in the aggregate financial structure of the farm sector are products of changes taking place on individual farms. Financial research on farm firms can be subdivided into three closely related topics.

Capital needs of farm firms.—In recent years, considerable discussion has centered around the increasing capital requirements of farming and how farmers will meet those requirements. Concern has been expressed that entry into farming will become even more difficult and that this will lead to domination of the farm sector by large-scale interests with special access to nontraditional sources of financing.

To evaluate these possibilities properly, we need first to know the magnitudes of capital needs at the firm level. This means that we have to know, for example, what kind of dairy operation will typify the viable competitive farm units, whether the operator is typically a part-time operator or whether he depends primarily on farm income, and what are the economic ties of the firm to its input suppliers and its market outlets. As a part of appraising needs for borrowed funds, we have to evaluate alternatives to ownership of production resources—alternatives such as machinery leasing, custom services, land rental, and livestock rental.

Financial management of farm firms.—Knowing the trends in farm size and the magnitudes of production assets that farmers do control or want or need to control is only a first step. How do farmers use the financial resources at their disposal to acquire access to the services of production assets? This is a question for farm financial management, which is the managerial process applied to farm financial decisions. It includes the acquisition, control, and use of financial resources to achieve the goals and objectives of the farm operator. As proper financial decisions become increasingly crucial to the survival and growth of farm firms, concern with problems of financial management is likely to equal or exceed concern with production decisions.

Interest in farm financial management research stems from two directions. On one hand, those who deal with farmers per se have a stake in understanding the financial alternatives, problems, and opportunities faced by farmers. Some may be concerned about farmers, others about how the decisions of farmers affect their own self-interests. The other source of interest stems from those who realize that the financial management decisions made by individual farmers will determine the patterns of change in the financial structure of agriculture in the aggregate.

Research in farm financial management can be structured around the strategies and opportunities for achieving farm financial goals. Thus, research is needed on problems and opportunities related to getting started in farming, firm financial growth, management for income stability under conditions of risk and uncertainty, disinvestment from farming, etc. Research needed as background for farm financial management studies includes research on farmer financial goals and attitudes towards alternative means for achieving those goals, and research on patterns and opportunities for acquiring access to resource services.

The development and articulation of a conceptual framework for farm financial management is a prerequisite to meaningful analysis and to effective communication within the profession. A forthcoming publication by Don Bostwick [1] outlines a suggested conceptual approach. A second [2] suggests a method for partitioning financial returns to the functions of ownership, investment, and entrepreneurship. We hope that these publications will be studied carefully and responded to constructively.

Research in farm financial management is becoming very popular. Without a proper conceptual framework, there is danger of considerable wasted effort by researchers who want to get on the bandwagon but who have no real understanding of farm financial management as a complex but, for research purposes, separable subset of farm management. Witness the attempts to rejuvenate production models and studies by tacking on financial management objectives such as firm growth. At some point in the future, it may be in order to integrate production decisions and financial decisions in farm management research. For the present, however, we are likely to learn more about farm financial management if at least a few researchers take production management decisions as given and concentrate on financial decisions as such.

Financial organization of the farm firm.—Finally, it is important to know the relationship between the financial needs and objectives of farmers and the form of business organization which they choose. To what extent do farmers incorporate or go into partnerships to acquire access to capital services? To what extent are vertical integration and production under contract simply strategies for obtaining financing? We need better information on the current and potential role of large-scale farms, particularly those with sales of $100,000 and over. What are their external economies? Do they have financing advantages? To what extent do they represent flows of capital into the farm sector from external sources and what are the sources, characteristics, and implications of those flows?

The financial structure and organization of the farm production sector

Research in "structure" per se is difficult because the term "structure" has no commonly accepted analytical meaning. Therefore, it is useful to define some researchable components. Among the components or aspects of financial structure needing research are the debt–asset structure of the farm sector and the distribution of resource ownership versus the use of resource services.

Analysis of asset–debt–equity structure of farming.—There is increasing evidence that estimates of aggregate farm debt and debt–asset ratios, such as those published in the USDA *Balance Sheet of Agriculture*, are not satisfactory measures of the financial status of important groups within the farm sector. It may be revealing to know how these debts and assets are distributed among groups of farmers. Preliminary data from the 1965 Census Sample Survey of Agriculture show that the top two economic classes of farms (those with sales of $20,000 or more) represent 12.6 percent of all farms but their operators owe 47 percent of all farm debt, including 44 percent of the farm real estate debt and 51 percent of the non–real estate debt. Futher research is needed to identify better those incurring farm debt. How are they using the debt capital? How does their use of debt affect the distribution of assets, income, and the number and size of farm units? Are some groups of farmers in strong financial position while others are in trouble? Are there significant differences in financial liquidity and strength among types of farms and among major type-of-farming and geographic regions? If so, why do these differences exist? Do the differences reflect differences in the availability of debt capital, the institutional structure of credit markets, or the vulnerability of farmers to financial risks?

Another reason why aggregate debt and asset statistics may not accurately portray the structure or well-being of the farm sector is that some portion of the assets and debts against them are held by nonfarmers. We need to know the extent to which nonfarmers are represented in aggregate data, who they are, and the extent to which their role is increasing or decreasing.

Given the increased capital intensity of farming and increased sophistication on the part of farmers in using debt capital for growth and operating leverage, we need new criteria for evaluating debt-carrying capacity and for determining "reasonable" debt-to-asset ratios. Because of the uneven distribution of debt and because debt-carrying capacity varies greatly by type of farm and by risk environment, the aggregate debt-to-asset ratios reflected in the *Balance Sheet of Agriculture* have limited analytical usefulness.

Analyses of the opportunities for and implications of separation of ownership and use of financial resources.—Both conceptualization and empirical research are needed on the separation of resource ownership and the use of resource services. A conceptual framework is particularly needed for evaluating the relationship between separation of ownership and use and perfection in the markets for services of financial resources. Complete separation of use and ownership has long been the norm in money markets. Between the owners and the users (that is, between the savers and the debtors) there has developed a complex institutional structure to facilitate the flow of money to places where the rewards for its services are greatest [7]. Thus, we can hypothesize that perfection in the market for resource services is closely related to separation of use and ownership. This is consistent with the observation that, in parts of the Corn Belt, production of grain on rented land is now the predominant situation. With the increased demand for land services, there has developed an increasingly competitive and sophisticated land rental market for tranferring the services of land from the owner to the most productive users. Perhaps there can never be complete perfection in land markets because of the physical immobility of land. But there is likely to be some narrowing in the wide range of returns to land use which have traditionally prevailed because the services of land were "locked in" through ownership patterns.

With respect to empirical research, we need to know the means and patterns by which use-rights to the services of financial resources are made available to farmers. What are the conditions under which services of resources owned by persons or institutions other than farmers will be made available for farm production, and what are the terms under which they will be made available? Do the terms of trade or degree of access to money, land, and other financial resources vary, depending on the size of the farm unit? On its organizational form?

Concern has been expressed that separation of ownership and use of resources will shift the locus of farm decision-making away from farm operators. We need research to provide intelligence on what is actually happening in this respect and what the possibilities are for the future.

The supply, demand, and markets for farm capital, including credit

The changes in the financial structure of agriculture imply the need for new research intelligence on the structure of credit markets and on the roles, adequacy, conduct, and performance of the lending institutions. Let me suggest four areas that need particular attention.

The use, cost, and availability of borrowed funds.—Every time the economy experiences a "tight money" situation, questions arise as to whether farmers are able to get the funds they need to farm. Questions are also asked about the effects of high interest rates on the use of borrowed funds. It is my general impression that most farm financial decisions are not so marginal that changes in interest rates of the magnitude we have experienced make them profitable or unprofitable. This is particularly the case with respect to annual production credit and intermediate term credit.

Nevertheless, there is still much we do not know about such things as how farmers use credit, the factors affecting successful use of credit, how farmers would respond to innovations in credit markets (such as permanent debt), and the economic rationale of loan terms. At the national policy level there is need to know whether credit gaps exist or whether there are structural deficiencies in the credit system that can be remedied.

Flow-of-funds analyses.—Most of the available measures of loanable funds are measures of how much debt is outstanding as of a given date. We have only crude estimates of the flow of funds throughout the year. Hence, we know little about the total demands on the farm credit market, and how these demands rise and fall during the production year, and how lending institutions adjust to the variations in demand.

Changing roles of major lender groups.—Over the years, changes have taken place in the roles and relative importance of various institutional and noninstitutional lender groups. Recent years have seen some interesting developments. John Brake [3] and Andrew Brimmer [5] have discussed the particular problems and opportunities facing commercial banks in serving the needs of farmers. They raised some interesting questions, but much research needs to be done before questions can be satisfactorily answered. What are the proper roles and policies of public or quasi-public farm credit institutions such as the Farmers Home Administration and the Farm Credit System if these institutions are to serve the best interests of farmers? Are new policies or new institutions needed?

Relationship of the growth of alternative sources of funds and capital services to weaknesses in the credit system or shortcomings of traditional sources of funds.—To what extent are land purchase contracts, merchant and dealer financing, and vertical integration the outgrowth of shortcomings or unfavorable characteristics of traditional sources of funds? Research that would provide answers to this question would also suggest how alternative modifications in the credit system might affect the ownership, debt, and decision structure of the farm sector.

The credit market is only a part of the total market for farm capital. Part of the demand for farm capital may be met with equity capital that is generated internally or that is supplied by nonfarmers. Selling stock in a farm corporation is a way of pulling equity capital into farming. Similarly, crop and livestock share-farming, vertical integration, hiring custom services, leasing, and production for sale under forward delivery contracts are among the direct and indirect means of acquiring access to capital owned by others.

In short, we need to know the total demand for farm capital, the sources of demand, the sources of supply, the conditions and terms of supply, and the implications for the ownership and income structure of the farm sector. These questions and others reflect the need for a "systems analysis" approach to the study of farm capital markets. Such an approach would improve our intelligence about the workings of the total farm capital market, including the credit system; the ways in which all the component institutions and pieces fit together; and the places where the strains and stresses appear as the demands on the system are varied. Any serious attempt to implement such an analysis would likely reveal serious gaps in our intelligence and thus would identify needed empirical research. Such an effort, if it is to be successful, will likely require a team approach and sustained financial support.

The income structure of the farm sector and the financial status of farmers

Given the growing dependence of farmers on the services and resources provided by others, what are the returns flowing to resources owned by different components of the agricultural industry, such as farm operators, lenders, the farm supply industry, and nonfarm landlords? Does this represent an economically equitable or desirable distribution of returns?

Currently, for each dollar's worth of farm products sold at the retail level, only 39 cents gets back to the farmer, who then distributes 31 cents to his resource suppliers.[3] What the farmer gets is the value added by the act of bringing resource services together, plus the returns to any resources he happens to own himself. A legitimate research question is whether, because of market power or institutional rigidities, nonfarm providers of services have first claims to their share of the farm income dollar, leaving the farmers to absorb market fluctuations. Certainly this partly underlies the current issue over farmer bargaining power.

If increasingly the owners of resources used by farmers are nonfarmers, there will be an increasing flow of farming-generated returns out of the farm sector. However, without improved research intelligence it is not possible to say what this shift in income distribution implies about the well-being of farm operators and the relative prosperity of the farm sector.

This redistribution of income has implications for national commodity and income policies. For example, if the underlying premise of an agricultural program is that farmers are owner-operators and if the benefits of the program accrue mainly to the fact of ownership, the farmer who rents land may gain less than an owner from a program designed to increase operator income. Research is needed to determine the importance of this issue.

As the farm sector becomes more and more integrated into the total economy, it becomes increasingly important in our research to recognize the nonfarm sources of income to people who also earn farm income. Official estimates place the current level of nonfarm income to farmers at $10.7 billion [11]. Moreover, income from the nonfarm sources seems to be increasing. With net income from farming holding relatively constant, nonfarm income to farm people may soon equal or exceed farm income in importance.

The recently published results of a study by Edward Reinsel [8] indicate that (1) most farm people have nonfarm sources of income, (2) for individuals with farm profits, additional income from off-farm sources averaged $2,130 and accounted for about half their total income, (3) for those reporting losses, off-farm income averaged $7,000, (4) among those with farm losses, the greater the reported farm loss, the larger the average net income from all sources combined and, apparently, the less likely that the individual made his living by farming. From this study, it is quite clear that the reported farm profits and losses alone are a poor indicator of the income situation of individuals. Off-farm income must also be taken into account. These findings also indicate that further research is needed on (1) the comparative efficiency and effectiveness of alternative public programs aimed at improving the income of farm people, (2) the flow of funds between farm and nonfarm sectors and the roles of nonfarmers who receive some farm income, and (3) the characteristics and implications of "tax-loss farming."

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[3] Based on preliminary estimates that the farmer's share of the marketing bill in the first half of 1968 was 39 cents. Farm production expenses were estimated to be 81 percent (32 cents) of receipts from sales of farm products [11].

Concluding Remarks

George Brandow [4] recently made two comments about research that are particularly appropriate to agricultural finance. The first point is that we need to get ahead of actual changes if the information generated by research is to be useful to decision-makers. The second point is that, to be able to meet specific needs on a timely basis, we must already have on hand the results of broad basic research and a thorough understanding of and some expertise in the subsector in question.

Changes in the financial structure of agriculture pose exciting research questions. I believe that we are on the threshold of an era of even greater structural change. The experience of the past two or three decades has been described as an "agricultural revolution." But the revolution we have witnessed has been largely technological. Technological change will continue, but I suggest that the agricultural revolution is now passing from the technological phase to the organizational or structural phase. Phase I was exciting. In its own way, Phase II will be equally exciting—and for economic researchers, far more challenging.

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Discussion: Changes in the Financial Structure of the Farm Sector and the Implications for Research

Fred H. Tyner, Jr.

In preparing this discussion of Dr. Lee's paper I have attempted to develop a set of questions as suggested by the title. These questions serve as a means of evaluating whether the author and I hold similar views as to the connotations of the subject.

I have not been critical for criticism's sake. You will recognize that this review is another expression of personal opinion. Dr. Lee has presented the subject in broad terms. My preference would have been for a more direct approach through a simpler organization of the material presented.

Let me list a few specific questions which I feel are relevant to this subject. What is the meaning of the term "financial structure"? Dr. Lee's definition of financial structure is quite inclusive—too much so. Perhaps it would be more instructive and conducive to logical thinking if it were paraphrased simply as "how agriculture is financed." With such a simplification, one can ask whether there are changes occurring at the firm, institution, or other level.

What changes have occurred, are occurring, and may be expected in the near future? And we need to know this: Has the structure been inadequate? How can the effectiveness or desirability of any emerging structure be evaluated? Such an evaluation is necessary, as Dr. Lee notes, in order to anticipate changes, influence their development, and provide a guide to the decision-makers whose dollars are involved.

We need to know what is causing these changes in the financial structure, and Dr. Lee refers to this phenomenon as technological change. This is true, but is it acceptable as an explanation by which to justify research? Technological change could occur without seriously affecting the way in which agriculture is financed. We know more about the problem than such generality implies. Is agriculture becoming more desirable or less desirable as an attractant for nonfarm funds? Has the variability in our farm

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Fred H. Tyner, Jr., *is associate professor in the Department of Agricultural Economics at the University of Florida.*

programs acted as a deterrent to capital from sources outside farming? Certainly farm programs have contributed significantly to the problems of financing agriculture—and this is not technological advance!

In turning to the implications for research, Dr. Lee describes four broad groups of research needs. Under "farm firm finance" he lists a need to know the magnitude of capital needs, and I agree. From this point one can proceed to evaluate the performance of existing institutions and theorize about additional sources.

In his next point, Lee distinguishes between decisions relating to financial management and decisions relating to production. This perplexes me. Why should financial management be separated from production decisions? Production is the end, and financial management is only one of the means to this end.

In his second broad grouping of research areas—the financial structure and organization of the farm production sector—Lee says that we need to identify better those incurring farm debt. How does their use of debt affect the distribution of assets and income and the number and size of farm units? How are nonfarmers acquiring farm resources, and is their role increasing or decreasing? These are relevant questions.

I do not agree with Dr. Lee's implication that perfection in the market for resource services is closely related to separation of use and ownership. This again is a production decision, and the relevant criterion is acquisition of resources at the least cost. The generality of the term "financial resources" probably clouds the issue also. Which represents the greater separation of ownership and use of resources, the farmer who buys a combine with borrowed funds, or the farmer who hires a custom operator with "owned" funds?

I do agree that we need to know the terms under which nonfarm resources are made available to farmers. How do lenders evaluate the borrower's worthiness for credit and ability to use debt profitably?

Dr. Lee gives more complete coverage to the subject of structure by referring to research needs in the areas of use, cost, and availability of borrowed funds; the changing roles of major lender groups; and the relationship of the growth of alternative sources of funds and capital services to weaknesses in the credit system or shortcomings of traditional sources of funds.

In my opinion, more explicit definitions of financial structure and financial resources would have led Dr. Lee to a clearer exposition of many of the ideas that he presented (especially those near the end of his paper) and would have eliminated some. The generality afforded by the basic terms used enhances the difficulty of limiting oneself to a concise statement of changes and needs.

Financial Organization and Production Choices

C. B. Baker

ECONOMISTS have become increasingly interested in growth problems of the farm firm. Consolidation and growth of the farm firm have accelerated in the commercial sector of U.S. agriculture as indeed in much of the rest of the world. So also has access to models relevant for the study of firm growth. Both changes have generated a renewed interest in managerial problems with financial content. In choices related to growth, consequences of financial alternatives are likely to be at least as important as those of production alternatives. Moreover, and more important still, production and financial alternatives are interrelated.

Economists can investigate hypotheses that explain growth or they can estimate effects of alternatives open to growth-conscious decision-makers. The first option casts the investigator in the role of an ex post observer engaged in improving our understanding of growth processes. The second casts him in the role of an ex ante adviser, engaged in producing information useful to the decision-maker in a prescriptive sense. We opt for the second role and will propose a model with properties relevant for prescriptive use. However, concepts implied by the model should be useful also to investigators in explanatory research. Any models failing to account for interrelations between production and financial alternatives are destined to be barren in use for testing hypotheses on firm growth.

It is most difficult to develop a model in terms general enough for wide empirical use and yet specific enough to be operational in any given setting. The primary issues engaged in the model to be outlined are (*a*) growth by intensification in use of capital and/or labor per unit of land versus growth by control of added land, (*b*) growth by ownership versus growth by lease of land resources, and (*c*) alternatives in financing the acquisition of land and nonland resources. In keeping with the topic assigned, I shall center considerable attention on the joint effects of financing and producing alternatives. Since the commonly used theory of the firm is essentially a production theory, it may be convenient to view the development of this paper as a modification of production theory occasioned by financial choices. In an earlier article [1] I have suggested the general modifications required. In the following pages I extend the argument to the special problems of long-term financing required for acquisition of real property.

The Type of Modifications Required

In the previous article I argued that it is not very useful to claim as optimum a combination of resources that equates their marginal rate of substi-

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C. B. Baker *is professor of agricultural economics at the University of Illinois.*

tution with their price ratio. To the price of each resource must be added the financial cost of acquiring each resource. Moreover, the financial cost is ill described by simply the interest cost of funds used to purchase the resource. At the least, liquidity is lost in converting cash to production resources, and the amount of loss varies by resource. In addition, entrepreneurial borrowing capacity is affected. The effect is direct if the farmer actually borrows. It is indirect if he does not. In either case, his borrowing capacity (that is, "credit") is absorbed as assets are transformed from more to less liquid form. And credit, it has been argued, is a resource valuable to the decision-maker because it is a source of liquidity. Thus, the condition producing an optimum in resource combination is an equality of marginal rate of substitution with the ratio of prices plus finance costs, the finance cost determined by procedures outlined in the earlier paper.

The same argument holds in the case of product mix. There is little reason to assume lender preferences among product alternatives to be the same as price ratios generated by product markets. Hence, the optimizing condition for a product equilibrium must be a marginal rate of substitution equal to the ratio of prices plus financial effects of output rates. The credit generated by the output of one product may be expected to differ, in general, from the credit generated by the output of another. Again, the necessary empirical procedures already have been suggested and will not be repeated here. Meanwhile, the intuitive appeal of the argument can readily be appreciated. We shall proceed, therefore, to an extension of the argument to acquisition of land resources. The institutional considerations and the model requirements justify a separate treatment.

The Special Problems of Land Resources

There is some danger to the model-builder from attempting to account for institutional problems. Institutions can change with bewildering speed. This may be happening in the financial environment of the farm firm. My own exposure suggests that it is hazardous to limit alternatives open to farmers too narrowly. Financial institutions in the United States respond quickly to changes in demand for financial resources and services. Yet in the here and now, farmers are constrained in financial choices to institutions and instruments immediately accessible to them. For the U.S. farmer this means real estate ordinarily distinct from non–real estate lenders. It means lessors who likely are different from either type of lender. And it means that the interactions occur between separable agencies in the environment of the farm firm, not within a given agency in the farm-related financial market.

Anyone who has budgeted or programmed with a model that casts leasing as an alternative to owning has experienced an interesting question: Why do farmers own land instead of leasing? Even with generous allowances for capital gains (or psychic returns) from land ownership, it is most difficult to find empirically relevant conditions that make ownership competitive with leasing, provided that the lessee is allowed to make nonfarm investments at market rates of returns. One of the answers may be found, however, in failure to account properly for financial interactions of lenders. The truth is that the rules of thumb used by non–real estate lenders are less favorable for the renter than for the owner-operator. Using modifications already suggested in optimizing criteria in production organization, it is not difficult to demonstrate that a farmer dependent on credit, either directly (by borrowing) or indirectly (for a source of liquidity) may be well advised to use some of his scarce resources to finance the purchase of land instead of leasing land. We abstract from the difficult real-world problems of finding land to lease *or* buy at the point in time appropriate in the growth pattern of the farm firm.

A somewhat similar problem arises in comparing a land purchase contract with a land purchase financed with a conventional farm mortgage. The increased leverage gained by land purchase contract guarantees its choice, at a given rate of interest, if the marginal value product of land exceeds the interest rate and no other account is taken of contractual differences between the land purchase contract and the conventional farm mortgage. If we exclude uncertain expectations, as is common in the ordinary budget or programming model, there is no point in including a conventional farm mortgage as an alternative. However, when the reaction of non–real estate lenders (and, to a lesser extent, real estate lenders) is taken into account, there may be important reasons for casting land purchase contract and conventional farm mortgage as alternatives in a planning model. Preliminary research at the University of Illinois suggests that equity acquired with a land purchase contract generates little or no credit that can be used for non–real estate borrowing.

All three methods of acquiring control of land resources generate annual obligations on the part of the farmer. If we are concerned with developing a model descriptive of alternatives and constraints important to the farmer, it should account for any differences that exist in the effects of rent, repayment commitment on land purchase contract, and repayment commitment on conventional farm mortgage. And in estimating the model, it becomes an important empirical objective. The orders of magnitude in the relevant reaction coefficients might suggest answers to questions not well answered by the commonly accepted theory of the firm or by budgets and linear programming models commonly used.

Let us summarize. We observe (1) that in the usual specification of models, leasing dominates ownership of land and finance by land purchase contract dominates finance by conventional farm mortgage; but (2) in the real world, farmers who grow include farmers who buy land—and often subject to conventional farm mortgage. One must conclude either that farmers are economically irrational or that the commonly used models are deficient in accounting for factors economically significant to the farmer. We already have suggested the second assumption as the point of departure for this paper. Specifically, the objective is to outline a model that generates an optimum allocation of investible funds, F, among real estate financed by farm mortgage (A), real estate financed by land purchase contract (B), and nonland assets (C), where the optimum relates to financial as well as to production alternatives and constraints.

A Suggested Model

By α, β, and γ we denote the percentage of debt in A, B, and C, respectively. Indeed, under well-recognized institutional restraints we can numerically bound the three parameters: $\alpha \leq 65$; $\beta \geq 71$; and $\gamma \leq 50$. The last parameter is subject to considerable refinement, as already has been suggested. It is plausible and empirically demonstrable that the farmer's financial environment includes a "credit profile"—credit quantities varied by source and type of credit. Hence, the above empirical specification on γ is to be considered a rough approximation. The values of α are determined by loan limits used by institutional and individual lenders on farm mortgage. In a model so specified, an array of constraint values would be included, one for each source of farm mortgage funds that can be separately identified by the farmer within the set of admissible alternatives. The Internal Revenue Service allows a farm seller to distribute over a period of time capital gains in farmland values if the buyer's down payment on land purchase contract does not exceed 29.5 percent. Hence the value specified for β.

By f^A, f^B, and f^C we denote the annual rate of return on current account from investment in A, B, and C, respectively; by g^A, g^B, and g^C, the capital gain (or loss) experienced from durable components of A or B or C, respectively. All returns are net of all costs except any interest costs that may be associated with finance of A, B, or C. Finally, we indicate by D^A, D^B, and D^C, debts incurred to finance A, B, and C, respectively; by d^A, d^B, and d^C, annual repayments on debt represented in A, B, and C, respectively. The annual repayments include an interest cost, I_A, I_B, I_C, and a principal payment, P_A, P_B, P_C. In commonly used models, the optimum is found in the condition simply that

$$\frac{MVP_A}{MC_A} = \frac{MVP_B}{MC_B} = \frac{MVP_C}{MC_C} = K, \qquad (K \geq 1.0)$$

where K is associated with a total capital limit imposed upon the farmer by his financial environment and MC's account for interest as well as other variable costs.

However, we have suggested that it is inappropriate, in an empirically relevant model, so to restrict the conception of the total capital limit. If one includes credit in the sense indicated, it becomes a resource (or, more appropriately, a set of resources) subject to entrepreneurial management. Hence we define a new set of coefficients $s_A{}^A$, $s_B{}^A$, $s_C{}^A$ as increments to farm mortgage credit, S^A, comprised of expectations on lender behavior in response to increase in equity in A, B, C, respectively; $s_A{}^B$, $s_B{}^B$, $s_C{}^B$ as increments to credit available for use in land purchase contract, S^B, from increase in equity in A, B, C, respectively; and $s_A{}^C$, $s_B{}^C$, $s_C{}^C$ as increments to non-real estate credit, S^C, from increase in equity in A, B, C, respectively. Credit amounts also can be influenced by production and marketing alternatives.

In Table 1 we sketch the outlines of a model with the required properties. It is cast in the form of a multiperiod linear programming model, showing the first and last of the periods that may be relevant. Elements under "row description" indicate resources in highly aggregative terms, most of which already have been defined. By A and B are meant land bought subject to conventional farm mortgage and land purchase contract, respectively, for \$1.00; by L, land leased for \$1.00. K denotes nonland capital other than cash. F is defined as cash: the stock of funds to be allocated at the beginning of each of the periods into which the model is divided. There follow three types of credit, among the many that actually exist. We distinguish merely real estate credit, based on conventional farm mortgage, S^A, real estate credit based on land purchase contract, S^B, and non-real estate credit, S^C. Should any of these sources of credit be used for borrowing, there is generated a debt that must be serviced, according to terms of the debt contract. The amounts of debt are indicated, respectively, as D^A, D^B, and D^C. We include, finally, a consumption requirement that must be met. It is so specified that the requirement in $t+1$ depends on cash transferred from t. See the coefficient $-(1+m)$ in the row Y_T. For simplicity of exposition, all right-hand-side elements are stated in terms of \$1.00 units. There may be reasons, of course, for different specifications in models designed to be operational.

All activity units likewise are stated in \$1.00 units. The three columns headed "Use A, B, C" include all activities in the production sector of a linear programming model. In the column "Consume" we specify the household consumption behavior, as is commonly done in multiperiod models, omitting, however, refinements such as meeting tax obligations. Likewise, because of the multiperiod properties of the model, there are specified columns to transfer to the next period cash, debts, and durable assets accumulated in any given period.

Otherwise, we provide for acquisition of resources by alternative financial means, as already indicated. In acquisition by purchase, land is made available in the period of purchase and in following periods as well, in contrast with land acquired by lease. In the case of either land or capital purchase, credit is affected, as indicated by the technical coefficients. We show these effects as diminutions in credit available because the activities transform assets from more to less liquid form. Actually, of course, the rates and direction of influence are to be determined empirically. Should behavior of relevant lenders be otherwise, the transactions might actually contribute credit rather than absorb credit.

The use of resources for producing (and marketing) likewise will affect credit. We show these effects as contributions to credit (all signs are negative in credit rows in "Use" activities). It is plausible to expect that lenders so incorporate income expectations into lending rules of thumb that the process of producing contributes to rather than absorbs credit.

There remain, finally, the financing transactions themselves: borrowing and debt-servicing. For each dollar borrowed (and thus supplied to cash) there is a $1.00 debt created in the relevant category. Moreover, the process of borrowing absorbs credit, as shown by positive coefficients in credit rows of borrowing activities. We show positive coefficients in all the credit rows. Such a specification reflects the general assumption that among alternate types and sources of loans the interaction terms are not zero. We assume, for example, that the non–real estate lender is not indifferent to the level of real estate debt. Similarly, in activities that provide for debt repayment, we indicate by negative coefficients an assumption that credit is generated in the process. The credit generated is shown in the period following debt repayment. Some coefficients may be zero in the case of either borrowing or repaying. For example, as indicated earlier, empirical evidence suggests that non–real estate lenders value equity subject to land purchase contract at little or nothing when appraising a loan application to finance non–real estate assets.

The model specifies the objective as a maximized sum of income and increments in net worth, all elements discounted for time. Capital gains are shown directly in the objective function by g_t^A, g_t^B, and g_t^C. It seems reasonable to exclude capital gains as a source of cash within the model period. They are not available directly for allocation decisions. The capital gains are shown to occur at the end of each period within the planning period. On the other hand, capital gains may generate added credit. If so, the coefficients in rows S_t^A, S_t^B, and S_t^C could be modified to take such lender behavior into account. It would be important to do so were the model to be specified to reflect the influence of capital gains on credit availability, period by period. Otherwise, the capital gains might be shown only at the end of the planning period. Such a specification reflects the assumption that the value of durable assets is relevant to the decision-maker only at the end of his planning horizon.

It is required that cash generated by the plan be transferred to the objec-

Table 1. A model for studying organization and growth alternatives, including financial

Row		Period 1														
		Acquire land			Buy	Borrow for			Use				Consume	Repay debt		
No.	Description	A_1	B_1	C_1	K_1	A_1	B_1	C_1	A_1	B_1	L_1	C_1		A_1	B_1	C_1
	Period 1															
1	Land: own A_1	-1							1							
2	own B_1		-1							1						
3	lease L_1			-1							1					
4	Capital K_1				-1				k_1^A	k_1^R	k_1^L	1				
5	Cash F_1	1	1	1	1	-1	-1	-1	$-f_1^A$	$-f_1^B$	$-f_1$	$-f_1^C$	1	d_1^A	d_1^B	d_1^C
6	Credit: f.m.[a] S_1^A	S_A^A	S_B^A		S_C^A	S_A^A	S_B^A	S_C^A	$-S^A$	$-S^A$	$-S^A$	$-S^A$				
7	l.p.c.[b] S_1^B	S_A^B	S_B^B		S_C^B	S_A^B	S_B^B	S_C^B	$-S^B$	$-S^B$	$-S^B$	$-S^B$				
8	n.r.e.[c] S_1^C	S_A^C	S_B^C		S_C^C	S_A^C	S_B^C	S_C^C	$-S^C$	$-S^C$	$-S^C$	$-S^C$				
9	Debt: f.m.[a] D_1^A					-1								$1+i$		
10	l.p.c.[b] D_1^B						-1								$1+i$	
11	n.r.e.[c] D_1^C							-1								$1+i$
12	Consume Y_1												1			
	Period T															
13	A_T	-1														
14	B_T		-1													
15	L_T															
16	K_T				$-k_T$											
17	F_T															
18	S_T^A													$-S_A^A$	$-S_B^A$	$-S_C^A$
19	S_T^B													$-S_A^B$	$-S_B^B$	$-S_C^B$
20	S_T^C													$-S_A^C$	$-S_B^C$	$-S_C^C$
21	D_T^A															
22	D_T^B															
23	D_T^C															
24	Y_T															
Plan value $= Z$	$=$	g^A	g^B		g^C											

[a] Farm mortgage
[b] Land purchase contract
[c] Non-real estate

Table 1. (*Continued*)

Row		Period 1				Period T								Relation	Constraint level
		Transfer				Consume	Transfer								
		debt			cash		land		K_T	cash	debt				
No.	Description	A_1	B_1	C_1			A_T	B_T			A_T	B_T	C_T		
	Period 1														
1	Land own A_1													$\leq$	b
2	own B_1													$\leq$	b
3	lease L_1													$\leq$	b
4	Capital K_1													$\leq$	b
5	Cash F_1				1									$\leq$	b
6	Credit: f.m.[a] S_1^A													$\leq$	b
7	l.p.c.[b] S_1^B													$\leq$	b
8	n.r.e.[c] S_1^C													$\leq$	b
9	Debt: f.m.[a] D_1^A													=	0
10	l.p.c.[b] D_1^B													=	0
11	n.r.e.[c] D_1^C													=	0
12	Consume: Y_1													$\leq$	b
	Period T														
13	A_T						1							=	0
14	B_T							1						=	0
15	L_T													=	0
16	K_T								1					=	0
17	F_T				-1	1				1				=	0
18	S_T^A													=	0
19	S_T^B													=	0
20	S_T^C													=	0
21	D_T^A	$-(1+i)$									1			=	0
22	D_T^B		$-(1+i)$									1		=	0
23	D_T^C			$-(1+i)$									1	=	0
24	Y_T				$-(1+m)$	1								=	0
Plan value $= Z$	=						$\frac{g^A}{(1+i)^T}$	$\frac{g^B}{(1+i)^T}$	$\frac{g^C}{(1+i)^T}$	$\frac{1}{(1+i)^T}$	$\frac{-d^A}{(1+i)^T}$	$\frac{-d^B}{(1+i)^T}$	$\frac{-d^C}{(1+i)^T}$	=	maximum

[a] Farm mortgage
[b] Land purchase contract
[c] Non-real estate

tive function. This is done by a single activity at the end of the planning period, showing the cash accumulated to be discounted for the relevant period of time. Alternatively, cash could be transferred at the end of each period, discounted appropriately for periods of increasing length.

Finally, there is the debt left unpaid at the end of the planning horizon. We refer, of course, to debt that is allowed to be unpaid, according to contractual terms, and which is, at optimum, left unpaid. These quantities too are to be discounted for time. There is no need, incidentally, for the rate of time discount to be the same as between debts and assets, or as among components of either. Should there be empirical reasons to suppose the rate of discount to vary, such an expectation can readily be shown in the specification of the objective function. So also can any special aversion to debt. The quantities d_2^A, d_2^B, d_2^C can be shown at one plus a percentage factor to reflect the aversion to debt in any of the categories indicated.

Three other means are available to reflect aversion to debt. One is to add a factor to i: the rate of interest charged as debt is transferred from one period to the next. A second is to specify a nonzero negative rate in the objective function for borrowing activities. Finally, a positive value can be placed in the slack vector for S_t^A, S_t^B, S_t^C, thereby reflecting a presumption that unused credit is a resource valued by the entrepreneur as a source of liquidity. In all cases, the specifications could, of course, be varied among periods to reflect any systematic effect of time progression on behavioral attributes of the farmer (for example, by reason of age or family requirements).

Some Empirical Results

No results can be reported from use of a model with all properties suggested in the previous section. However, a few suggestive results can be indicated from models in which some of the features have been used. In an early single-period version, Irwin and Baker [4] found that the purchase of cattle could displace the purchase of fertilizer despite the higher marginal value product for fertilizer. The reason was the fact that credit was absorbed at a lower rate for cattle than for fertilizer. Neuman [5] found that an optimizing decision-maker would vary his resource acquisitions seasonally to take into account lender reactions to financial positions. Thus, a farmer could increase his total credit within a year by purchasing, first cattle, then machinery, rather than the reverse. Rogers [6] found that circumstances are available where it is optimum for a farmer to use merchant credit in financing parts of his farm organization, despite higher interest costs associated with such credit. Again, the explanation lies in relative rates of credit absorption.

In a later study, Vandeputte [8] found that non–real estate lenders vary credit limits for a large-scale low-equity dairy farmer in Illinois in response to variations in amount of real estate debt and to variations in amount of annual commitment to payment of real estate debt. The result is variation in growth rate for farms organized optimally with respect to varied specifications on debt terms. The production organization also is affected. Shortening the length of payment period on real estate debt reduces the total interest bill which the farmer pays, but it constrains his growth rate and operational flexibility, because non–real estate lenders reduce credit made available as the annual commitment increases. The reduction is offset to some extent because they also respond positively to increase in real estate equity. However, preliminary results show that the first effect is stronger than the second.

Also of interest is the effect of alternate assumptions on the rate of appreciation in land values. Increasing the rate of appreciation increased the amount of land bought, of course, as well as shifting land purchases forward within the planning period. It also reduced, in the optimum farm organization, resources in livestock production in favor of resources added to grain production. Such a diversion would be implied by the production relations in the model. It was reinforced by the financial relations.

Allen Smith [7] attempted to compare land purchase contracts with conventional farm mortgages as financial alternatives available to a large-scale low-equity cash grain farmer in Illinois. Again, non–real estate lenders were found to be sensitive to real estate debt and to the terms of the debt contract as well. In this case, farm organization and the growth rates were affected, not only by size of loan and the size of annual payment, but also by the difference between land purchase contracts and conventional farm mortgages in terms of "quality" of equity generated by amortization of real estate debt. As already reported, the credit response of non–real estate lenders tends to be less to equity above a land purchase contract than it is to equity above a conventional farm mortgage. Thus, the leverage acquired by the farmer by using a land purchase contract, with its lower down payment, may be seriously modified by reactions of non–real estate lenders. In preliminary runs with a linear programming model containing many of the properties suggested, little or no increase could be produced with a land purchase contract, in terms of a growth rate, to repay the farmer for the financial uncertainties associated with the land purchase contract.

Concluding Remarks

It is apparent that the production equilibria indicated above may be modified by specifications of the model indicated. They will be so modified if (*a*) lender behavior, or, to be more specific, borrower expectations on lender behavior, do not conform to value weights on resources or products that are generated by the market, and/or if (*b*) entrepreneurial behavior, in valuing credit as a source of liquidity, does not conform with market-generated prices on resources and products. There is little reason to suppose such conformance in either case. Some empirical evidence is available to support the case for *a*. Such data are needed as a basis for improving model specifications with respect to *b*.

The addition of financial specifications in a linear programming model add substantially to data requirements. Moreover, the requirements imply the need for observations in areas and by means that may not be familiar to the farm management investigator [2]. Coefficients related to generation or absorption of credit must be based on behavioral properties of lenders accessible (or admissible) to the farmer. An attitudinal survey of farmers would be irrelevant as a source of information on these coefficients. On the other hand, coefficients to describe debt aversion and valuation of unused credit as a source of liquidity are based on farmer behavior. In both cases, procedures required for reliable results have yet largely to be developed, though at least modest success may be claimed for preliminary work done on lender behavior.

Two sectors might be added to make the suggested model more comprehensive. The first is a "prefarming" period. Alternatives in this period might include different types of employment, including farm and part-time farm employment, and alternative types of investment, both farm and nonfarm. The second is an "estate-planning" period. It might include several years that follow the active farming years of the operator. Actually, some elements of estate-planning might well appear in earlier years as well. To my knowledge, little attention has been given to the "prefarming" stage. At the University of Illinois, we have begun some work on the "postfarming" stage [3], though much needs yet to be done to make useful models operational.

It might be argued that the suggested model fails to reflect the changing environment in which farm firms are organized for production, marketing, and growth. What about production contracts, capital leases, and varied forms (and directions) of integration? Actually, the type of model suggested is highly adaptable to these kinds of changes. Without minimizing the difficulties of introducing appropriate alternatives and constraints, I argue that the principal limitation is lack of information to make the specifications empirically relevant and accurate.

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Discussion: Financial Organization and Production Choices

WILLIAM McD. HERR

This paper is a logical development and integration of a series of studies published by Baker and his students. The major thrust of this work is recognition that the kind of resource acquired and the method of financing use up a firm's "credit" and affect liquidity at different rates. Thus, the real price of the resource acquired is not the market price but the market price plus these financial effects. Studies by Dr. Baker and his associates have been able to demonstrate that, when these financial effects are considered, production choices as determined by market forces can be altered substantially.

On the basis of these documented observations, Dr. Baker shows how these financial effects can be incorporated into a firm growth model. This gives his entire model a strong financial orientation. Other than this, the model has much in common with other growth models [4, 5]. It is a polyperiod linear programming model and focuses on alternative methods of acquiring land. The model is not tested but "suggestive results" are indicated from previous studies.

Baker's paper provokes a number and variety of thoughts. First, I should like to acknowledge that Dr. Baker's inquiries into the effects of liquidity and borrowing capacity are an important contribution to our understanding of how financing impinges on the organization of the farm firm. Few studies have rigorously demonstrated these financial effects as clearly as those of Dr. Baker. Given that financing alternatives affect production choices, it would seem necessary to construct some growth models capable of illustrating their importance.

Although I am impressed with the main theme of Dr. Baker's research, he leaves me less convinced of the importance of liquidity, credit absorp-

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WILLIAM McD. HERR *is professor of agricultural economics at Southern Illinois University.*

tion, and the special problem of land resources in the context of firm growth. To put it simply, it is interesting and in some cases important to know how to incorporate these financial effects in a firm growth model, but are these the important missing links that will make firm growth models more useful and meaningful than they have been to date? My review of firm growth models suggests that as large or larger rewards are likely to accrue to research efforts directed to problems of changing technology, discount rates, consumption functions, capital gains, taxes, and variability of returns.

This is not to say that credit absorption and liquidity can be disregarded but only that their effects in many situations are likely to be masked by the above or other considerations. For example, it would seem more important to include financial effects in a growth model of a low-equity or tenant farm than in one whose equity ratio is not allowed to fall below some specified level or where the ownership component is large.

One might extend this argument concerning relevance somewhat further. Baker gives special attention to the problem of land resources, indicating that the liquidity–credit effects of acquiring land through using a mortgage may account for its general wide use, even though budgets and programming models show land leasing and land contracts to be economically superior. At one point Baker concludes that because farmers continue to use mortgages widely either they are irrational or commonly used models are deficient. Although he opts for the second choice, I am not convinced that either is entirely accurate. The use of land contracts and leasing has been increasing [1], which might be indicative that farmers are rational and our models are accurate.

But even should we conclude that our models are deficient, it is not clear that their deficiency is in terms of inadequately accounting for liquidity or the relative amounts of credit generated by alternative methods of acquiring land. In preliminary results from a growth model developed by Bates [2], which focuses on alternative ways of financing both land and nonland resources, we have found that the optimum alternative method of acquiring land for farm enlargement (cash buy, credit, or lease) changed, depending upon capital leasing rates, credit terms, and prices on nonland resources. Moreover, other aspects of mortgages and land contracts might account for the continued large use of farm real estate mortgages. For example, the opportunity to buy a particular parcel may require that the buyer use a mortgage and the buyer may prefer the mortgage because of the greater risk associated with the contract. Lending some credence to this view, Bradley [3] reported that farmers would rather finance the purchase of land for expansion with a mortgage than with a contract. Moreover he was unable to detect significant variations in farmer acceptance of a mortgage and contract by age, size, or equity ratio.

Nevertheless, as one considers further the implication of Baker's emphasis on financial effects, I can not help but wonder whether some of us will not have to come around the full circle and restore security and financial considerations to a higher order of importance in credit decisions than formerly. Although expenditures that boost income and repayment capacity must still receive top priority in credit decisions, amount and kinds of security required may also reflect "financial effects" as seen by the lender and the borrower.

The paper also has a number of broader implications worth exploring. One of these is that it helps identify the relationship between the field of farm financial management and farm management. Frequently, efforts directed to defining these two areas have not been very illuminating. Dr. Baker, however, clearly indicates some of the financial factors which modify production theory and in so doing identifies variables which become part of the field of financial management. If we view these financial factors as simply other costs and returns, then production theory need not be modified and financial management and farm management merge into one.

In the long run, I see in Dr. Baker's work, and in growth model work generally, the beginnings of concepts, procedures, and findings that may help us understand and project changes in the financial organization of farming. There are a number of pressures which may cause the typical pattern of operator–ownership of land and nonland resources to change in the future. Understanding these pressures for and against change can be adequately tested only in more general models than have been constructed to date. Baker's model goes a long way in helping researchers to focus on this aspect. All too often, research in farm finance has focused on credit terms and institutions. It is invigorating to see the field given renewed impetus with the inclusion of "financial effects." It is largely with this in mind that I look forward to seeing Dr. Baker's model made operational.

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CONTRIBUTED PAPERS: FARM MANAGEMENT AND PRODUCTION ECONOMICS

CHAIRMAN: JOHN SCHMIDT, UNIVERSITY OF WISCONSIN

Cost Analysis and Profitability of a Service with Seasonal Character*

YAAQOV GOLDSCHMIDT

ALTHOUGH in economic analysis no distinction is made between service and productive activities, often there are difficulties in analyzing and pricing services. The purpose of this paper is to suggest a method of analysis for a service department in a firm, where demand for the service has seasonal fluctuations.

Suggested Method of Analysis

Service activities are considered and analyzed similarly to regular (production) activities. Whenever a service can be bought (sold) on the market, this service has an opportunity cost (realizable revenue). The market price is used in the analytical framework as a transfer price for the service transferred from the service department to the production enterprises. In this way the service department will earn income similarly to any production enterprise.

The crucial cost concept to be used in this analysis is avoidable cost. Avoidable cost is defined as any cost that can be or could have been eliminated by an appropriate managerial decision. Avoidable costs include both (*a*) explicit costs such as fuel or insurance, and (*b*) implicit costs such as interest on liquid assets (tractors).[1]

When the demand for a service fluctuates periodically, a two-part charging method is applied.[2] The two-part charging method means that the consumer is required to pay two charges: (*a*) for the right to use the service, and (*b*) for the actual use of the service, a charge which varies directly with the level of use.

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* I am indebted to Mr. K. Admon for his part in developing some of the points and to Professors G. L. Casler and B. F. Stanton for their comments on an early draft of this paper. The data were kindly provided by Mr. A. Atzmon.

[1] For a system providing these procedures see my forthcoming book [1].

[2] Application of this method to pricing electricity was suggested in England as early as 1892 by J. Hopkinson [2, Chap. 2] and is in use in France [3, 4, 5].

YAAQOV GOLDSCHMIDT *is research associate at Cornell University.*

An Example

Consider a farm that has several enterprises and a fleet of tractors which serve the various enterprises. There is an active second-hand market for these tractors. Assume that the genuine data presented below[3] are typical of the farm's situation and hence can be used for decision making. Assume also, for the sake of simplicity, that all the tractors are similar in working condition and that their sale value is approximately equal. Data pertaining to the monthly use of the fleet of nine tractors by several enterprises in a large farm in Israel are charted in Figure 1.

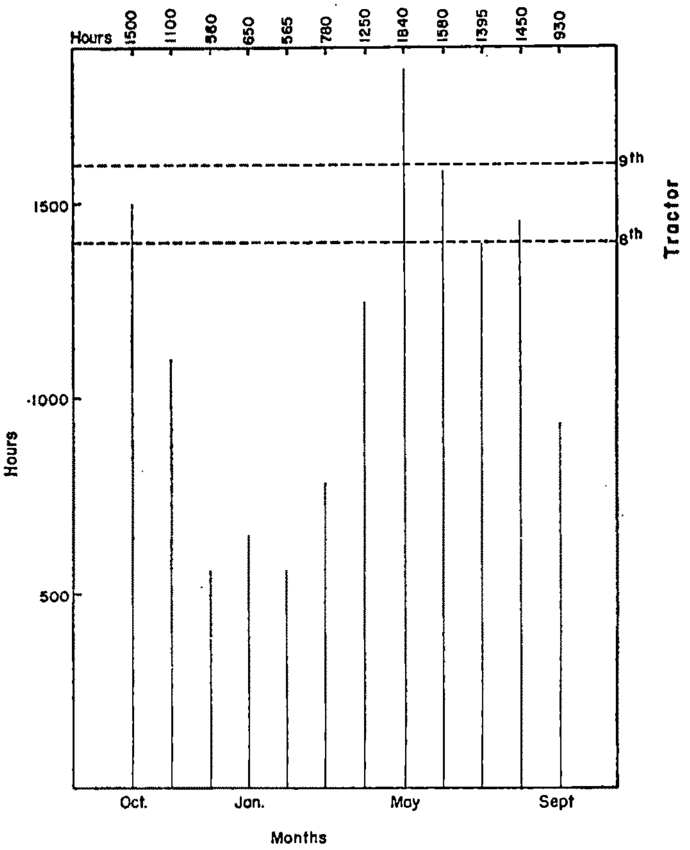

Figure 1. Monthly use of tractor services in hours (Israeli farm)

The monthly fluctuations in the demand for the tractors' services result from rather rigid time requirements of field operations in agricultural production. That is, tractor services must be rendered at specific dates or periods. Nevertheless, it is assumed that during any given month the time requirements for tractors' services are flexible. In the example, the peak demand for tractor services is in May. This peak naturally determines the number of tractors on the farm.

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[3] The data pertaining to 1963-64 are rounded and presented in Figure 1 and Tables 1 and 2.

In May, all the tractors are used at full capacity. Since the total amount of service in May is 1,840 hours, the expected output of each of the nine tractors is about 200 hours per month. If peak demand could have been cut by 200 hours either by reducing crop requirements or by hiring tractor services from outside the farm, only eight tractors would have been necessary. Eight tractors will suffice to meet demand in all of the other months. In other words, the marginal tractor on this farm is kept for only 200 hours of service. In practice, this fact may not be recognized because all or most of the tractors are employed during the other high-use months as well, but each is used fewer hours per month. The very act of plotting these data on a chart, as is done in Figure 1, provides information that is otherwise easy to overlook.

A distinction is made between two types of costs: (*a*) operating costs, such as fuel and repairs, which are directly proportional to the amount of use, and (*b*) holding costs, such as insurance, change in value (depreciation), and implicit interest, which result from the tractor's being kept on the farm. Both types of cost are avoidable, but in different contexts of analysis. Operating costs are avoidable in the context of the level of operation of the tractors, holding costs in the context of number of tractors kept on the farm. The costs pertaining to the tractors are provided in Table 1.

Table 1. Data pertaining to and costs of tractors (Israel farm)[a]

Item		Annual costs	Units	Costs per unit
(1) Operating costs, total		31,650	13,600 hrs.	2.33
(2) Sale value: beginning of year	40,000			
(3) end of year	33,400			
(4) Holding costs: change in value (2)−(3)	6,600			
(5) interest, 12% on (2)	4,800			
(6) insurance	1,350			
(7) Holding costs, total (4)+(5)+(6)		12,750	9 tractors	1,417
(8) peak season (May)			1,840 hrs.	6.93
(9) Total annual costs		44,400		

[a] All cost figures are in I £ (one I £=$0.33).

Analyzing the Profitability of the Tractors

Suppose that the farm can hire as many tractors as required at any time at a cost of I £5.00 per hour (1 Israeli £ = $0.33). During the year the farm uses 13,600 hours of tractor service, saving an outlay of 13,600 ×

5 = I £68,000. This sum is considered as the tractor department's revenue. Since total annual avoidable costs are I £44,400, this department provides an annual contribution of I £23,600.

The profitability of the marginal or ninth tractor should be analyzed. The ninth tractor is kept only because of the demand in the peak season (May), during which it is used about 200 hours (more accurately, 204 hours). This implies that the holding costs per hour in May are I £1,417 ÷ 204 h. = I £6.93 (Table 1). The total avoidable costs per hour in May (holding and operating costs) are 6.93 + 2.33 = I £9.26. This cost should be compared to the market price for an hour of tractor service in May. Any price below this avoidable cost figure means that the ninth tractor is not profitable. The farm will profit from selling one tractor and hiring tractor services in the peak season.

The profitability of the eighth tractor should be calculated in a similar manner. Suppose there are only seven tractors on the farm, with a capacity to render 1,400 hours of service in any month. The eighth tractor is needed for service in those months where the requirements are above 1,400 hours. The marginal services that have to be rendered by the ninth and eighth tractors are illustrated by means of two horizontal broken lines drawn in Figure 1. There are 530 hours for the year that are above 1,400 and below 1,600 hours per month (Oct. 100 h., May 200 h., June 180 h., Aug. 50 h.). These hours are assigned to the eighth tractor. The holding costs per hour are I £1,417 ÷ 530 h. = I £2.67. Total costs per hour attributed to the eighth tractor are 2.67 + 2.33 = I £5.00.

If the custom rate for tractor services is I £5.00 per hour, then there is neither profit nor loss associated with the eighth tractor. By implication, all of the other seven tractors are profitable.

Charging Tractor Services to Users

Charging tractor services to users is analyzed under two situations: (*a*) when there is an external market for these services, and (*b*) when no external market exists. First, when it is possible to hire tractors in any required amount and at any time, say for I £5.00 per hour, this rate should be used by the tractor service department in making charges to all users. If the marginal tractor costs more than this to operate, as indicated earlier, it creates a loss for the tractor department.

Second, suppose that tractors cannot be hired and all avoidable costs are charged to the users. The conventional pratice is to charge a flat rate (average totals costs) for the hours of service provided to the users during the year. Avoidable costs per hour are I £44,400 ÷ 13,600 h. = I £3.26. This practice ignores the seasonal character of demand and does not consider extra costs caused by providing services in the peak season. A two-part charging or pricing method surmounts this limitation.

Under the two-part charging method each user is charged (*a*) operating costs for all the services he uses, that is, I £2.33 per hour, and (*b*) holding costs for the services used in May, that is, I £6.93 per hour (rows 1 and 8, Table 1). The two-part charging method implies that holding costs are paid by the users of the service during the peak season. This is because these users determine the number of tractors on the farm. Once the number of tractors is determined, the holding costs become a "free good" in an economic sense. The fact that someone is using a tractor any time outside the peak season does not in any way limit the availability of tractors' service to other users. Only the operating costs are avoidable and are charged to the users. A comparison of two methods, flat-rate charging and two-part charging, is provided in Table 2.

Table 2. Tractor services and alternative charges to users (Israeli farm)[a]

Item	User							Total
	Cotton	Sugar beets	Cereals	Vegetables	Green fodder	Orchards	Farmstead	
Use of tractors								
(1) Annual hours	1,940	2 485	1,805	1,530	1,045	1,615	3,180	13,600
(2) percent	14	18	13	11	8	12	23	
(3) May, hours	200	425	425	205	15	280	290	1,840
(4) percent	11	23	23	11	1	15	16	
Flat-rate charges[b]	6,333	8 113	5,893	4,995	3,412	5,272	10,382	44,400
Two-part charging method								
(6) Operating costs[c]	4,515	5 783	4,201	3,561	2,432	3,758	7,400	
(7) Holding costs[d]	1,386	2 945	2,945	1,421	104	1,940	2,009	
(8) Total charges	5,901	8 728	7,146	4,982	2,536	5,698	9,409	44,400
Difference between totals								
(9) Absolute	—432	615	1,253	—13	—876	426	—973	
(10) Percent	— 7	8	21	—	— 26	8	— 9	

[a] Rounded figures. All cost figures are in I£.
[b] I £3.2647 × (1).
[c] I £2.3272 × (1).
[d] I £6.9293 × (3).

Note the difference in the charges to the various users by the two methods. The green fodder enterprise, for example, hardly uses tractors in May and pays mainly operating costs under the two-part method. Its charges are 26 percent below those arrived at by the flat-rate method. On the other hand, the cereals enterprise, which requires more services in May than at other times, is charged 21 percent more.

It might well be argued that enterprises that use tractor services evenly during the year should be charged a flat rate per hour. In fact, the total charges are equal under both methods. Still, the two-part charging method has its merits. If such an enterprise can reduce its demand in the peak season, it will benefit by escaping the "penalized" peak price. This may enable the farm to reduce its number of tractors.

Suppose that the management finds the ninth tractor to be "profitable" because the additional revenue created by its services during the peak season exceeds the high cost of holding the tractor for use in only one month. Thus, for example, the cereals enterprise is "ready" to pay the extra I £1,253 (row 9, Table 2) rather than reduce its scale of operations. Hence, the ninth tractor is kept on the farm. While tractors are underemployed 11 months in a year, economically speaking they are still efficient.

There are several limitations and possible pitfalls to the outlined analysis: (*a*) the nondivisibility of the tractor units, (*b*) the possibility of two different peaks in demand (or a wide plateau), each with a different set of users' shares, and (*c*) the possibility of a shift in the peak to another period, partly because of the pricing method. Such limitations might reduce the appeal of the outlined method of analysis. Nevertheless, in principle the method is applicable and can provide useful information for internal decisions and control. Moreover, it has a wide range of other applications.

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A Simulation Program to Establish Optimum Crop Patterns on Irrigated Farms Based on Preseason Estimates of Water Supply

Raymond L. Anderson

THIS paper describes a simulation program for a digital computer that is designed to establish an optimum crop pattern on irrigated farms. The program called PLAN is designed to make the most efficient use of the predicted water supply throughout the season in order to derive the highest net income. A basic part of the program is crop response to soil moisture conditions, which varies for individual crops over a season and among periods in the growth cycle.

Schedules of adequate soil moisture conditions for crops and of reductions in yields that result from missing specified irrigation turns are input data for the program. The program uses three decision points: an irrigation organization allocates water to farms, and irrigators and farm managers make decisions as to which crops to water and in what order. The PLAN routine determines the optimum crop pattern to be grown on each farm based on the water supply of the individual farm and its seasonal availability.

The results of four computer runs using three water supply situations are presented to illustrate the effects of the planning process on the acres of crops to be grown under different water supply expectations and on farm and area incomes.

Table 1 contains estimates, based on evapotranspiration studies, of irri-

Table 1. Typical irrigation sequences for selected crops, based on two-week intervals during the crop-growing season

Crop	Irrigation period[a] April		May		June		July–Aug.					Sept.		Oct.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
	inches of water allocated to farm[b]														
Alfalfa	—	—	12	—	11.0	—	—	13	—	—	12				48
Corn	—	—	6	—	8.0	—	5	6	8	—	6				39
Small grain	10	—	5	—	8.0	—	6								29
Potatoes	—	—	—	5	4	4	4	4	4	4	4	4			37

[a] Each irrigation period is considered to be 14 days in length starting in April. Water supply is allocated to the irrigation system by these 2-week periods.

[b] A 50-percent efficiency is assumed from the source of supply to the soil root zone, excepting alfalfa, which has a much deeper root system.

Raymond L. Anderson *is a research economist with the Economic Research Service, USDA, stationed at Colorado State University.*

gation water necessary to produce specified yields of selected crops. Table 2 shows estimated yield reductions from missing specified irrigation turns. Yield reductions have not been fully documented, but enough research has been done to indicate the levels of yield reduction that are likely to occur from water shortages on crops at various stages of their growth cycles. In field experience, the weather that occurs during the period when a crop goes without an indicated irrigation can have an effect on yield that is different from that specified in the table. A cool, humid period would not place as high an evapotranspiration demand on crops and soils as a hot, low-humidity, windy period. But when generalized estimates of consumptive water use are specified, as they are here, generalized estimates of yield reduction can be made justifiably to correspond to specified irrigations.

Table 2. Estimated reductions in crop yields when a specified irrigation is not applied to specified crops

Crop	Irrigation period[a]													
	April		May		June		July–Aug.					Sept.		Oct.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	percent reduction in yield													
Alfalfa	—	—	35	—	30	—	—	30	—	—	20			
Corn	—	—	20	—	20	—	40	15	20	—	10			
Small grain	25	—	25	—	25	—	15							
Potatoes	—	—	—	15	15	15	20	20	20	20	15	8		

[a] Each irrigation period is considered to be 14 days in length starting in April. Water supply is allocated to the irrigation system by these 2-week periods.

Assumptions

1. Each acre receives either (*a*) full requirement or (*b*) none. Figures represent losses resulting from none during a period.
2. Two successive "misses" equal total loss, except alfalfa.
3. Percentage reduction is applied to expected yield of moment—except the two successive losses.
4. There is a direct relation between physical yield and value of crops; that is, water reduction affects yield and not quality.

The Simulation Model

Component parts of the simulation program represent respectively the irrigation organization that allocates and distributes water to farms, irrigators who apply water to crops, and farm managers who specify the order in which crops are to be watered. Figure 1 shows the flow of control through the simulation model, which consists of a main program and eight subroutines.

A brief description of the planning process of the program will show how the model operates. Before the crop season begins, the water supply

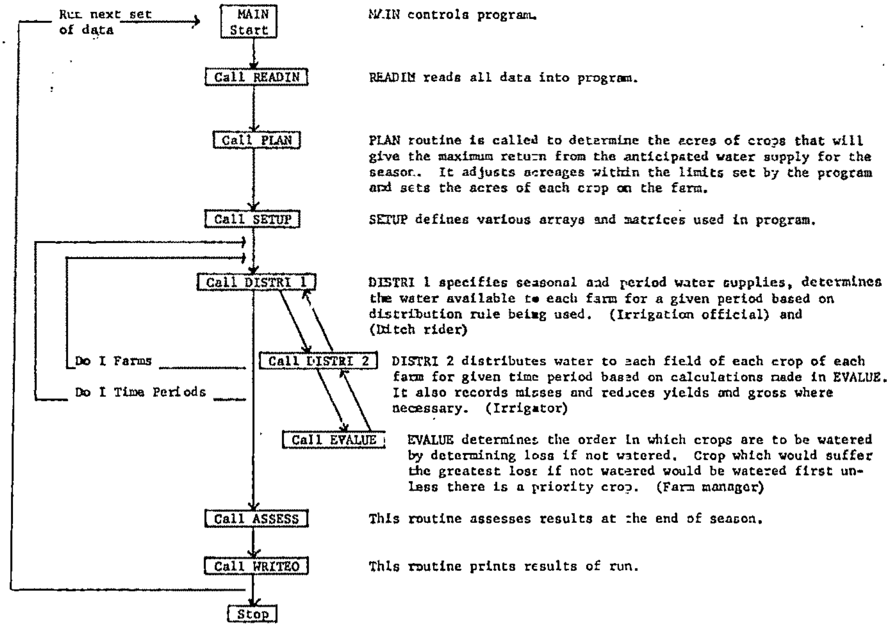
Run next set of data
MAIN Start
MAIN controls program.
Call READIN
READIN reads all data into program.
Call PLAN
PLAN routine is called to determine the acres of crops that will give the maximum return from the anticipated water supply for the season. It adjusts acreages within the limits set by the program and sets the acres of each crop on the farm.
Call SETUP
SETUP defines various arrays and matrices used in program.
Call DISTRI 1
DISTRI 1 specifies seasonal and period water supplies, determines the water available to each farm for a given period based on distribution rule being used. (Irrigation official) and (Ditch rider)
Do I Farms
Do I Time Periods
Call DISTRI 2
DISTRI 2 distributes water to each field of each crop of each farm for given time period based on calculations made in EVALUE. It also records misses and reduces yields and gross where necessary. (Irrigator)
Call EVALUE
EVALUE determines the order in which crops are to be watered by determining loss if not watered. Crop which would suffer the greatest loss if not watered would be watered first unless there is a priority crop. (Farm manager)
Call ASSESS
This routine assesses results at the end of season.
Call WRITEO
This routine prints results of run.
Stop

Figure 1. Flow chart of irrigation system simulation

outlook is given. This includes total seasonal supply and its distribution over the season. The data used in the program are equivalent to the anticipated seasonal supply of an organization based on its water rights and reservoir supply. Water supplies available to individual farms depend upon the farm's share of the organization's supply or on the rules used by the organization to distribute water.

At the start of the simulation, basic data are put into the program by means of subroutine READIN. These include seasonal water supply, number and sizes of farms, crops grown, minimum and maximum acreages of each crop on each farm, potential yields, costs and gross returns for each crop, water requirements for each crop, and yield losses from not watering in specified periods (Tables 1 and 2). The MAIN program shifts control to subroutine SETUP, which defines the various arrays and matrices to be used in the program and stores information throughout the season. The program is then ready to run, and control is shifted to subroutine PLAN.

The PLAN routine starts with the specified minimum acreages of each crop on a farm and then applies to these the farm's predicted water supply for an entire season. It then increases by a specified amount the acreage of the highest-valued crop and runs the season again. If a farm's profit position is improved, the allowable maximum limit of the crop has not been reached, and water remains available, the highest-value crop is again increased, and the process is repeated until the allowable limit of the crop is reached or water supply becomes limiting. The program then selects the next-high-value crop and brings in as many acres as possible, given acreage and water supply restrictions. This process is continued until no improvement in profit is possible. The PLAN routine continues until no farm can gain by making adjustments in its use of water. At this point the program prints out the recommended acres of crops, anticipated yields, and gross and net returns from the predicted water supply. This may seem a tedious process, but the program can run over 60 different crop patterns for four farms in about 30 seconds of machine time.

Table 3 shows the crop patterns, production, and incomes resulting

Table 3. Summary of production on irrigated farms, with four water supply situations

Production	Unit	Situation 1		Situation 2		Situation 3		Situation 4	
		Acres	Seasonal water supply 22,700 in.	Acres	No water in time periods 9 and 10	Acres	20 % reduction in water supply (18,130 in.)	Acres	Fixed acreages; water supply 18,130 in.
		............production, water applied, and income...............							
Farm 1–180 acres									
Corn	Cwt.	54	3,078	54	2,462	48.6	2,770.2	54	3,078
Small grain	Bu.	10.8	432	54	2,160	0	0	54	1,491.7
Potatoes	Cwt.	59.4	13,365	0	0	48.6	10,935	54	8,582.2
Alfalfa	Ton	54	270	54	270	39.6	198	18	54.1
Total water	In.		7,360.2		5,756		5,657.71		5,304
Gross return	$		31,787.10		15,982.00		25,497.03		22,727.45
Net return	$		8,225.71		3,963.06		6,597.54		976.79
Farm 2–150 acres									
Corn	Cwt.	72	4,104	72	3,283	40.5	2,308.5	45	2,565
Small grain	Bu.	0	0	0	0	4.5	171.0	45	1,338.7
Potatoes	Cwt.	49.5	11,137.5	0	0	40.5	9,112.5	45	7,658.1
Alfalfa	Ton	28.5	142.5	52.5	262.5	33	165	15	47.9
Total water	In.		6,093		4,664		4,860.04		4,509.43
Gross return	$		27,873.75		13,976.00		21,555.30		19,831.67
Net return	$		7,385.21		4,472.69		5,577.33		1,706.12
Farm 3–125 acres									
Corn	Cwt.	37.5	2,137.5	37.5	1,710.0	37.5	2,137.5	37.5	2,137.5
Small grain	Bu.	7.5	300	37.5	1,500	0	0	37.5	1,115.6
Potatoes	Cwt.	41.2	9,281.2	0	0	33.7	7,593.7	37.5	6,803.6
Alfalfa	Ton	37.5	187.5	37.5	187.5	27.5	137.5	12.5	39.9
Total water	In.		5,111.25		4,034		4,074.13		3,797.2
Gross return	$		22,074.37		11,100.00		18,240.62		17,074.83
Net return	$		5,712.30		2,752.13		4,758.55		1,970.20
Farm 4–100 acres									
Corn	Cwt.	30	1,710	30	1,368	27	1,539	30	1,710
Small grain	Bu.	6	240	30	1,200	3	114	30	892.5
Potatoes	Cwt.	33	7,425	0	0	27	6,075	30	5,105.4
Alfalfa	Ton	30	150	30	150	22	110	10	31.9
Total water	In.		4,089		3,198		3,240.02		3,006.29
Gross return	$		17,659.50		8,880.00		14,370.20		13,221.11
Net return	$		4,569.84		2,773.62		3,718.22		1,137.41
Irrigation project totals									
Corn	Cwt.	193.5	11,029.5	193.5	8,823	153.6	8,755.2	166.5	9,490.5
Small grain	Bu.	24.3	972	121.5	4,860	7.5	285	166.5	4,838.5
Potatoes	Cwt.	183.1	41,208.7	0	0	149.8	33,716.2	166.5	28,149.3
Alfalfa	Ton	150	750	174	870	122.1	610.5	55.5	173.8
Total water	In.		22,653.45		17,652.00		17,831.9		16,616.92
Gross return	$		99,394.72		49,938.00		79,663.12		72,855.06
Net return	$		25,893.06		13,961.50		20,651.64		5,790.52

from four runs, using three water supply situations. The first is based on liberal water supply throughout the season. Crop pattern is largely restricted by acreage limitations on crops. The second has ample water early in the season, but a severe shortage during the latter part of the irrigation season results in a loss of the potato crop. The third is a season-long shortage of about 20 percent less water than was used in the first situation. The fourth situation shows the results from having the same water supply as the third situation, but acreages were fixed, allowing no planning in the face of developing water shortages. In all of the runs, each farm has a share in the system's supply that is nearly equal to its share of land area.

This simulation technique is designed to take into account seasonal variation in irrigation water supply on individual crops and individual farms within an irrigation system. The model is designed to allow for variations in number of farms, crops, water requirements, yield reductions, anticipated seasonal water supply, yields, costs, and returns. The program is written in Fortram IV, modified to be acceptable to Fortram II compilers, and has been run on CDC 6400 and IBM 7094. Space limitations do not allow further elaboration of the model or discussion of its limitations.

Tax Shelters in Agriculture: An Example for Beef Breeding Herds*

HOY F. CARMAN**

MANY high-income investors deduct substantial farming losses from their nonfarm incomes. Farmers have expressed concern over competing with operations which do not need to show an operating profit. Their concern has been registered by Senator Metcalf (D-Montana), who has introduced a bill in the U.S. Senate to limit the use of farming losses to reduce taxes on nonfarm income [6, p. 37].

What are the tax advantages of incurring operating losses from a farm investment? This paper will analyze the after-tax returns for a tax-sheltered investment in beef breeding cattle. It will show how investors in high-income tax brackets profit while incurring apparent large cash losses from their investment. It will also demonstrate that taxpayers in the highest marginal tax brackets have the greatest incentive to locate investments, such as breeding cattle, which offer some tax shelter.

An essential feature of a tax-sheltered investment is the opportunity to realize capital appreciation. This appreciation may be the result of generally rising values or it may be due to property improvements which can be deducted from taxable income as an ordinary expense.[1] Beef breeding cattle fall in the latter category. Livestock held for breeding purposes for more than 12 months are considered capital assets and any gain is taxed at a maximum rate of 25 percent. Costs of raising breeding cattle are a deductible expense and purchased breeding stock are depreciable property.

Table 1 presents a model budget for an investment in 100 beef breeding cows for a six-year period. A management company purchases bred cows for an investor, places them on a ranch under a maintenance contract, and manages the investment for a fee of 8.5 percent of gross cash expenditures.[2] The investor makes a down payment of 10 percent on the cows. He must prepay interest on the cattle mortgage and also prepay the

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[1] Real property investments adjacent to rapidly expanding urban areas are made with the expectation of sharp increases in value. The second type of increase in value is discussed by Carter and Dean for the case of establishing orchards [2, p. 766].

[2] The operations of a management company are described in a *Fortune* article [1]. The budget in Table 1 incorporates the essential features of such an arrangement. Fees for purchasing the cattle are paid in full when the cattle are purchased.

HOY F. CARMAN *is assistant professor of agricultural economics and assistant agricultural economist in the experiment station and on the Giannini Foundation, University of California, Davis.*

Table 1. Budget for 100-cow investment illustrating cattle numbers, sales, expenses, and cash requirements, six-year projection, Nov. 1 to Oct. 31 each year

End of contract year	Cattle numbers[a]				Cattle sales[b]				Expenses[c]							
	Cows	Two's	Yearlings	Calves	Culls		Steer calves		Prepaid interest	Maintenance	Management fees	Cash total	Depreciation	Mortgage payment	Mortgage balance	Net cash required
	number				*number*	*value*	*number*	*value*	*dollars*							
	100								1,728	7,400	2,816	11,944		2,400	21,600	14,344
1	88			43	12 cows	2,100	42	4,914	1,168	8,361	810	10,339	5,428	7,000	14,600	10,265
2	77		38	38	11 cows 5 yearlings	2,618	37	4,329	616	9,384	850	10,850	1,047	6,900	7,700	10,803
3	68	33	33	33	9 cows 5 two's 5 yearlings	2,978	32	3,744	80	10,675	914	11,669	733	6,700	1,000	11,647
4	89	29	29	43	12 cows 4 two's 4 yearlings	3,240	43	5,031	—	12,147	1,032	13,179	486	1,000	—	5,908
5	104	36	38	50	14 cows 3 two's 5 yearlings	3,420	50	5,850	—	13,822	1,175	14,997	281	—	—	5,727
6	sell all cattle				130 cows 38 two's 50 yearlings 111 calves	58,527							121			
Total								23,868				72,978	8,096			58,694

[a] Represents numbers at the end of each contract year after culls and steer calves have been sold. The calving rate is 85 percent and one-half are assumed to be heifers.

[b] Culling is based on 12 percent of the number of cattle at the beginning of the contract year. Net cull proceeds are computed at 75 percent of the market value of cattle as breeding stock. Any gain from the sale of culls is taxed as capital gains. The market value of cattle for breeding stock for this projection is calves, $117; yearlings, $170; two's, $210; cows 3–5 years, $240; cows 6–7 years, $230; and cows 8–9 years, $200.

[c] Interest is 8 percent of the mortgage balance. Maintenance is based on the following annual rates: cows and two's, $74; yearlings, $54; and calves, $43. Management fees are 8.5 percent of gross cash expenditures (excluding mortgage payments). Depreciation is computed on a six-year life for purchased cows, using the sum-of-the-years'-digits method with $150 salvage value. There is a special depreciation allowance of 20 percent on the first $20,000 for persons filing a joint return for contract year 1 [5, p. 35].

maintenance fee.[3] The contract year for the example runs from November 1 to October 31. Each October, the cattle are culled, the steer calves are sold,[4] a mortgage payment is made (usually about equal to sale proceeds for the culls and steer calves), and the contracts are renewed. It is important to note that the investor does not purchase a ranch or take part in day-to-day management decisions.[5]

Assumptions implicit in the construction of Table 1 are based on conditions existing during the fall of 1967. Changes in maintenance costs, culling rate, prices of cattle, interest rates, and calving percentage will affect the profitability of the investment. Although it is relatively simple to dispose of beef breeding cows, the profitability of the investment depends on maintaining the animals long enough to raise breeding stock. The investor must therefore be willing to tie his money up for an intermediate time period.

An investor would have net cash requirements of $58,694 during the six-year life of the investment as budgeted in Table 1. Disposing of all the cattle at the end of the sixth year would result in proceeds of $12,987 from 111 calves and $45,540 from 218 head of breeding stock for a total cash return of $58,527. The investor thus has cash requirements exceeding total cash returns by $167. The inclusion of taxes on the cattle sale changes the picture considerably. The calf proceeds are taxed as ordinary income, whereas the proceeds from breeding stock are taxed as capital gains at a maximum rate of 25 percent. An investor in the 70-percent tax bracket would thus pay taxes of $20,476 and have $38,051 remaining ($58,527 − $20,476).[6] It appears that he has lost $20,643 from his investment after paying taxes. He has, however, been able to deduct a total of $57,206 from his tax returns during the six years of the investment. This deduction is made up of depreciation ($8,096) and the excess of cash expenses over calf sales ($49,110). The investor's after-tax cost is thus the net cash cost minus 70 percent of depreciation and expenses, or $18,650 ($58,694 − 70% of $57,206). After-tax recovery ($38,051) minus after-tax cost ($18,650) results in a net gain of $19,401 from the investment.[7]

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[3] The maintenance fee includes a charge for breeding the cows of approximately $8 per head. A death loss of not to exceed 2 percent is also included in the fee. The fees outlined in footnote *c* of Table 1 result in a total charge comparable to that paid under actual contract arrangements [4, p. 25].

[4] It is also possible to trade the steer calves for heifers with no taxable gain. More cash would be required of the investor but the herd size would increase faster than in the budgeted example.

[5] Martin and Gatz found that the general effect of ranches as tax shelters cannot be large enough to affect greatly the general level of ranch prices even with the purchase of breeding cattle with the ranch [3].

[6] All tax computations are based on 1967 tax rate schedules for married taxpayers filing joint returns.

[7] The gains in these computations do not consider the additional tax advantage of moving to lower marginal tax brackets.

Similar computations can easily be made for taxpayers in other tax brackets. The vertical difference between the solid lines in Figure 1 illustrates the net gains available to taxpayers in the various marginal income tax brackets using the 100-cow budget in Table 1. Taxpayers in all brackets above the 25-percent level would realize net gains. It is doubtful, however, that taxpayers in the lower marginal tax brackets could generate the large cash requirements during the first four years of the investment.

An alternate cost and revenue situation is depicted by the dotted lines in Figure 1. Dotted line 1 shows the effect of a 25-percent decrease in cattle prices. Taxpayers above the 48-percent bracket would still realize after-tax gains. Dotted line 2 shows the effect of a 5-percent compound annual increase in maintenance costs. Taxpayers above the 32-percent bracket would realize gains. Taxpayers above the 58-percent tax bracket would realize after-tax gains even with a 25-percent decrease in cattle prices and a 5-percent compound annual increase in maintenance costs. In fact, costs would have to increase 5 percent annually and cattle prices would have to fall 43.5 percent from the budgeted level before taxpayers in the 70-percent tax bracket would begin to lose money. The apparent cash loss while breaking even would be $35,976.

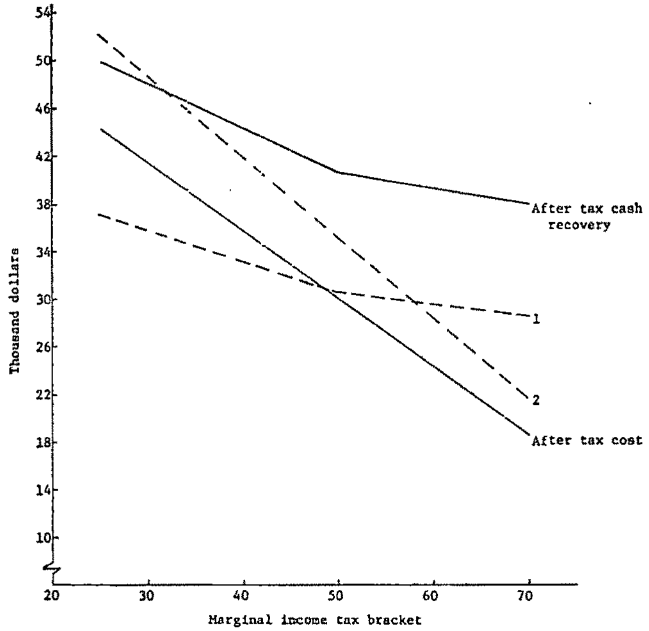

Figure 1. After-tax cash recovery and real cost by marginal income tax rate for investment in 100-cow breeding herd, based on 1967 tax rates for joint returns

One should not conclude from the preceding discussion that the purpose of tax-sheltered investments in breeding cattle is to lose money through inefficient ranch operations. Contracts are written to assure that ranchers caring for contract cattle are as efficient as possible in their operations. Operating losses are incurred in this type of investment because only half of the calf crop is sold each year. All of the heifer calves are converted to breeding stock, which is taxed at the capital gains rate when sold.

The potential profitability of tax-sheltered investments in agriculture raises several interesting and important questions. How extensive are tax-sheltered investments in breeding cattle, citrus groves, orchards, vineyards, and urban land? What are the supply implications of these investments and what are the costs and returns to both producers and consumers? Are tax-sheltered incentives necessary to get capital into agriculture? Where are tax-sheltered investments located and do they lead to differential rates of regional development? What effect will Senator Metcalf's bill have on the flow of speculative capital into agriculture? Finally, can other capital sources easily take the place of tax-sheltered investments if these investments are discontinued? Answers to these questions can have important implications to planning for our agricultural growth and development and certainly merit consideration by our profession.

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Three Myths About the Balance Sheet: The Changing Financial Structure of Farming

GEORGE D. IRWIN

DON PAARLBERG [4] has written of the feeling in every man's breast of knowing about economics. He describes a series of myths which permeate the common man's concept of economics. Agricultural commentators, economists included, seem to have a similar feeling of knowing about the financial structure of the farming industry. My thesis is that they commonly subscribe to at least three myths. Each myth centers around the USDA *Balance Sheet of Agriculture* [6], probably the almost universal starting point in discussing financial structure.

Webster defines *myth* as a "belief held uncritically, esp. by an interested group." Myths may have historical basis in fact. They may also be embellished with the passing of time, and their historical context may be lost. Thus, a changing setting and institutional context may be the process that converts facts into myths. Yet they remain in the mass mind as reality. So it is with the *Balance Sheet.*

A Changing Setting and the *Balance Sheet*

The *Balance Sheet* includes the value of tangible production assets on all physical plants which the Census calls farms, plus many household and financial assets of the group of individuals classified as farm operators, and the corresponding liabilities. Since it was first developed in the 1940's as a measure of financial structure, farm production has changed from being interdependent with the rest of the economy only in product markets to being heavily interrelated in both input and product senses. The engine of change has been technology, and its fruits have included specialization, larger units, and increased separation of ownership from use of productive resources. We have responded by broadening the definition of agriculture to include farm supply, farm production, and farm product marketing. But the *Balance Sheet* refers to the old concept of agriculture, which we now call the farm sector or farm production industry.

As these interrelationships have increased, the concept of the completely owner-operated unit has become an anachronism. Farming is no longer adequately defined as a set of production units primarily owned and operated by the farm family engaged in agricultural production. A balance sheet for the production sector will no longer do almost as well as a statement of the aggregate welfare of farm families, with slight additions.

GEORGE D. IRWIN *is an agricultural economist with the Economic Research Service, USDA, stationed at Purdue University.*

Misuses were recognized as early as 1949 [2], and they have matured into full-blown myths as the financial structure of agriculture has changed since then. Laymen and economists alike persist in indiscriminately applying the old definition and the traditional data series to the emerging creature. In the remainder of this paper, my mission is to point out facts which dispel three of the myths that have evolved.

Myth 1: The Balance Sheet of Agriculture is an approximate balance sheet for farm operators.

Two facts suffice to discredit this belief. First, persons other than farmer operators own many of the assets used in farming and owe many of the debts against those assets. Among the tangible production assets on the physical plants of farms, land has by far the largest dollar value. It makes up some 68 percent of the 1968 value of assets. It is equally clear that landlords own substantial shares of farmland. For example, the 1964 Census [5] indicated that about 35 percent of the farmland in Illinois was operated by full tenants and an unspecified additional amount was rented from landlords by part owners.

Second, many farm operators have assets in businesses other than the included farm cooperatives and may have debts against them. Many also own common stocks and bonds and other financial assets not included in the present *Balance Sheet.* It is doubtful that the farm is or can be operated independently of these other investments. It is equally doubtful that assets and borrowing of one are independent of the other.

The importance of the distinctions can be shown by applying some preliminary ratios from recent tabulations of information in the 1965 Census Sample Survey to the *Balance Sheet* for January 1, 1968. Persons other than the operators of farming units[1] (*a*) own about 39 percent of farm real estate but owe only 23 percent of the real estate debt, (*b*) own about 15 percent of other physical assets but owe only 11 percent of non–real estate debt, and (*c*) own about one-third of the equity in all assets. The debt-to-asset ratio on real estate is some 16.5 percent for operators vs. only 7.7 percent for others. To equate a balance sheet for the farm production sector with that for farm operators is folly, and the resulting conclusions are extremely misleading.

Myth 2: The farm production sector has ample reserve for borrowing, since the debt–asset ratio is much lower than a similar figure calculated for other manufacturing industries.

Recent reports [3], for example, indicate that the 1967 ratios were 17 percent in the farm production sector vs. 41 for all manufacturing corporations.[2] The trouble here is that the two sets of data have different bases of valuation. The *farm production sector* figures are based on revaluing assets at *current prices* each year. Those for *manufacturing* are based on *book value,* or cost at purchase. The difference produces the greatest discrepancy for long-lived assets, the very kind that dominate in farming.

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[1] Until more refined data become available, it is not possible to separate from the "nonfarmer" group some large farmers who rent land to other farmers.

John Brake [1] used percentage of farm transfers each year and actual increases in land prices to estimate that the 1965 book value of farmland would be about 55 percent of current value. If we apply this figure to deflate the 1968 value for land only, the debt–asset ratio for the farm production sector goes from 17.7 percent on current value to 25.6 on book value. For farm operators, the figures are 21.2 percent on current value vs. 29 percent on book value. These figures raise some question about the common belief that farmers have very strong debt aversion. The figures also imply less opportunity than has recently been suggested for sophisticated financial managers, willing to go into debt, to move in and hasten the demise of the family farm. Of course a 10-percent average differential even on book value may suggest some potential. But we need to investigate comparable lives of assets in farm production and manufacturing with data that are less gross before drawing a firm conclusion.

Myth 3: Because debt in the farm production sector is rising but reported income is not, the sector is suffering from increasingly poor financial health.

Farm policy debates have generally failed to recognize that growing interdependence has consigned this statement to myth for at least three reasons. First, it fails to distinguish between the farm operator and others. Some $8.3 billion of the $49.9-billion debt on farm production assets is owed by others. One clearly cannot assume that this debt depends on farming income alone for repayment. Second, we can no longer assume that the only income of farm operators is from farming. Published USDA 1966 estimates indicate that their nonfarm earnings are around $6.9 billion compared to $14.4 billion of farm earnings [7, Table 5H]. These estimates may be low. (For example, the 1964 Census appears to show the nonfarm income in 1964 at nearer $10 billion [5] or nearly 70 cents for every dollar on farm income.) These dollars, too, are available for repaying their debts.

Third, there may not be a one-to-one correspondence between real estate debts and assets on the current balance sheet. The land assets are included if they are in Census-defined farming operations, and include value of land, land improvements, dwellings, and farm buildings. Real estate debt is total loans for land which reporting lenders classify as "agricultural." In much of New England and in urban fringes over most of the country, some loans classed as for "agricultural real estate" may be, not for acreage included in farms, but in land for speculative purposes. These sorts of debt bear no relation to any figure on income from farm operations.

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[2] Footnote 3 of Francis' report [3] recognizes the distinction between current and book value, but the text does not.

Potential Myths

Two further structural developments have the potential for creating myths. (1) The appearance of integrated and conglomerate farm-nonfarm operations are blurring the concept of farm operator, farm assets, and farming sector for certain commodities. It may become possible to have meaningful analyses only by an industry approach and by excluding these kinds of operations from a balance sheet. (2) The trend toward asset ownership moving off the farm and the services flowing back as annual purchases may mean that we will be able to measure changes in financial structure only if we have both the balance sheet and the new flows.

Conclusion

If any general conclusions can be drawn, they are that interpretation of our data series needs to keep up with the times, the data series themselves need periodic updating, and economists have an unmet responsibility to satisfy a largely unrealized need for more accurate interpretations of the changing financial structure of farming. I'm happy to be able to report that the thoughts presented here grew partly from discussions held in the Agricultural Finance Branch of FPED, ERS. A number of resulting recommendations should appear as clarifications in future published series, as improved data make them possible. I urge you to join in an invigorated investigation of questions of financial structure.

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ECONOMICS OF STOCK NATURAL RESOURCE USE

CHAIRMAN: JOHN C. FREY, PENNSYLVANIA STATE UNIVERSITY

Economic, Technological, and Policy Consideration of Stock Resources*

MICHAEL F. BREWER

The Meaning and Significance of "Stock" Resources

STOCK resources have provided an inexhaustible set of issues for economic discussion. Writings of the British classical and Austrian marginal utility schools contain references to the mine, as does Marshall. Later, L. C. Gray developed a limited conceptual framework [4] within which generic questions associated with the development, management, and use of stock resources subsequently have received attention. An excellent state-of-the-arts volume recently has been prepared on the subject under the able editorship of Mason Gaffney.

Much of the postwar attention paid to stock resource problems reflected concern that they might "run out" and thus jeopardize growth of the national economy. The hypothesis on which this argument was premised received empirical analysis by Barnett and Morse [2], Ruttan [5], and others, who found little evidence to support the contention that dwindling supplies of exhaustible resources were imposing higher costs on the national economy. To the contrary, available evidence suggested that technological change has been more rapid and effective in the natural resources sector than throughout the economy generally—affording broad latitude for substitution among raw materials and their parent resources. This was reflected in declining trends of prices for natural resources commodities relative to those of the economy at large. Though allaying fear that stock resources use would retard economic growth, these studies did little to broaden the basic concept of stock resources.

Stock interpretations of "stock resources"

Early resource economics literature made much of the distinction between stock and flow resources. The parent concept—namely, that of a resource—was taken to represent some component of the natural environment judged by a planning agent as capable of satisfying a want or demand at a given point in time and space.

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* The views expressed in this paper are those of the author and do not necessarily reflect those of Resources for the Future.

MICHAEL F. BREWER *is vice-president of Resources for the Future, Inc.*

The "stock" character of a resource has been most precisely spelled out by Ciriacy-Wantrup [3], who suggests that over the time span of concern to the planning agent no appreciable addition is made to the number of physical units available for use.

The standard notion of stock resources often is illustrated by a mineral deposit containing ore above the prevailing threshold of commercial concentration. If the deposit and its quality are known to a potential miner, he doubtless will adopt a planning horizon long enough to include the depreciation of capital investment in the form of a mine, and/or the length of time required to exhaust the deposit. The more he extracts at one point of time, the less remains for the balance of his planning interval. Important economic questions inhere in this situation, relating to optimal rates of extraction, optimal schedules for capital investment, the stability of use rates within the planning interval, the economic impact of technological advance on the resources, and prediction of price paths.

Stock quality of the environment

There are other natural resource problems which can usefully be explored within the context of "stock resource." In particular, certain problems of pollution and environmental quality appear analogous to classical stock resource problems and pose similar questions relating to the development of technology.

The condition, or quality, of our environment may itself be considered a stock resource. Elements of the environment—namely, resources—are transformed in the production process to yield a product and a set of residuals. The environmental receptacle which receives these wastes is characterized at any point in time by a certain "quality" and an associated capacity for waste assimilation which cannot be exceeded without quality deterioration.

Although the process of product and waste generation is basic in form, it is subject to manipulation. The Law of Conservation of Matter requires the physical mass of both to be constant, but the ratio between residuals and product yields can be modified by technology, as can the solid, liquid, or gaseous forms which residuals may assume. Technology also may reduce the costs which residuals may impose upon third parties and thus increase the social value of the initial resource.

Generic Problems in the Application and Development of Stock Resource Technology

The role of technology in "stock resource" management and use will be considered for three prototype situations: a terrestrial mineral deposit, open-access marine mineral resources, and the waste-assimilative capacity of the environment. Within each, the incentive for and consequences of technological change differ, with quite different implications for policy.

Technology and terrestrial mineral deposits

Terrestrial minerals remain one of the most important stock resources, and clearly technology has transformed their extraction, their processing, and the very structure of the minerals industries. To trace this influence, consider a mineral deposit. Let us assume that it is physically characterized by three distinct zones of concentration. Into this terrain comes a potential miner with capital sufficient to construct and operate a mine, to concentrate and transform the ore into "packages of raw materials" useful for the production of several final products. Our prospector–miner of course will do all this *if* he locates a mineral deposit of adequate value.

Let us now examine the effect of change in several types of technology on the value of our as-yet-undiscovered mineral deposit. Because it starts out unknown, it has no initial value. Yet our prospector means business and is exploring the area systematically. He will, in due course, run across the deposit (one of the three zones) and it will then be assigned an initial value. Subsequent exploration will yield a more stable, though possibly revised, value, assuming that demand for the raw material remains constant. Technological change in exploration procedure will reduce the time (and/or cost) incurred in finding, and result in an increase in the inherent present value of, the *in situ* deposit.[1]

When discovery occurs, the prospector will visualize the processes of mining, extraction, ore concentration, and processing which he anticipates. By predicting the raw material price, and estimating the costs of these activities, he can calculate a residual which will set the value of the *in situ* deposit. Technological change affecting the costs of mining and/or processing activities will affect the present value of the deposit determined in this way.

If perceptive, our miner will recognize that the raw materials which he provides will be employed in the production of consumer goods. Technological changes may affect these production functions—perhaps lower the cost, and eventually the price, of consumer goods—with a resulting increase in sales and enlargement of the derived demand for the raw material. This would have at least the short-run effect of increasing the price, and thus the present value, of the mineral deposit. Should our prospector be truly perspicacious, he might imagine technological change affecting final consumer demand, with at least short-run increases in product price and a chance that some of the economic surplus thus created might induce an increase in the price of the raw material input, and from there to the present value of the mineral deposit.

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[1] This assumes that the assigned value reflects the uncertainty of exploration information currently in hand.

In this scenario, technological change has been identified at four points in time, space, and process: exploration, extraction–refining processing, production of consumer goods, and the purchase of those goods by consumers.

Three questions of economic significance may be posed:

1. At which point whould technological change be sought?
2. How much should be invested toward this end?
3. Is optimal investment likely to occur in the absence of specifically designed policies?

Economically efficient investment in technology requires fulfillment of familiar marginal conditions: the marginal cost of securing technological change should equal the marginal social returns. The correct identification and calculation of these costs and returns may be extremely difficult. There is not time to develop these difficulties in detail, but the adequacy of investment incentives can be examined if we strip some of them away by assumption. If we assume that the "public share" of both the social costs and benefits of technological change are about equal, we can focus on the "private share." In this limited context, there will be incentive for approximately[2] the efficient level of investment, if the gains can be appropriated by the relevant decision agent. We can estimate the likelihood of this occurrence by generalizing about the benefit and beneficiary of each type of technolocical advance.

1. Technological advance in exploration enhances the present value of the deposit by discovering its value at an earlier point in time and/or reducing the cost of exploration whenever done.

2. Technological advance in the extraction–processing stage has the basic effect of reducing the cost of converting ore of a given concentration into the packaged raw material. This gain might be considered as an economic surplus to be allocated to the miner–processor and/or the purchaser of raw material, depending upon its effects on the price of raw material. On the other hand, a reduced processing cost may lower the percentage concentration at which the *in situ* mineral is commercially profitable. Thus, the innovation might permit the commercial deposit to include Zones 3 and/or 2, whereas under the previous technology, only the highly concentrated Zone 1 was profitable. In the first instance, the impact of processing technology is partial upon the present value of the regional mineral deposit. In the second, it is direct. In both instances, the miner will be a beneficiary.[3] If the reduction in processing cost is passed

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[2] Differences between private and social time preferences will persist; thus, the level of incentives will only approximate the efficient level.

[3] The implicit assumption is that the miner is claimant to the enhanced value of the *in situ* deposit.

on to the producers of goods for final consumption through reduction in prices of raw materials, they obviously become additional beneficiaries of the technological breakthrough.

3. Benefits from a technological change in the production of consumer goods generally would remain with the producer, unless the raw material seller is a monopolist—in which case the surplus would be shared. Even a nonmonopolist miner may benefit from a larger volume of sales if the savings in production of consumption goods result in lower product prices under elastic demand.

4. A technological change resulting in larger demand for consumer goods would have second-order effects, if any, on the price of raw material, and thence to the present value of the mineral deposit. Beneficiaries presumably would include the consumer, the producer of the consumer good, and eventually, the vender–miner of the raw material.

The beneficiaries and directions of influence on present value of the mineral deposit of each type of technological change are categorized in Table 1. This classification must be modified to reflect different industry structure. For example, some large manufacturers using metals find that they can reduce the number of processing steps needed, and thus the cost of production, by vertically integrating their firm to undertake metal processing and even mining. To the extent that vertical integration exists, the producer becomes a beneficiary of technological change earlier in the mine-to-product spectrum, and the mineral deposit becomes increasingly single-use oriented. More comprehensive integration can be found in industrial complexes in which mining, processing, and multiple-product manufacturing are undertaken under similar management—in which case our classification collapses.

Table 1. Beneficiaries and directions of influence on present value of mineral deposit of various types of technological change

Type of technical advance	Beneficiary	Directness of influence on present value of mineral deposit
Exploration	Miner	Direct
Mining and processing	Miner (producer if $P_{rm} \uparrow$)	Direct (if quantity of commercial ore is expanded thereby)
Commodity production	Producer (miner if $P_{rm} \uparrow$)	Indirect
Consumer utilization	Consumer, producer, miner	Very indirect
	P_{rm} = raw material price	

Technological development of open-access resources

A somewhat different problem is posed by a technology for discovering, extracting, and utilizing stock resources with ill-defined property rights.

This problem has been encountered in the mineral resources of the oceans —beyond the Continental Shelf, for which property rights have not been established. The basic question is this: Does the absence of tenure security reduce incentives for developing a marine mineral technology below the optimum? The case presumably may be argued in the affirmative when resulting benefits outweigh the cost, and yet investment in its expansion is not forthcoming. Appropriate policy either may remove obstacles to private investment or commit public funds to this purpose.

Let us first consider the technology associated with the exploration of the marine environments, which would include mobile submersibles and associated sensing systems, as well as surface, and possibly space, vehicles. To the extent that there is a reasonably strong market for the information gained through environmental exploration, there would be incentive for private entrepreneurs to use and to develop further such an exploration technology. Nevertheless, one must ask whether these firms could be expected to undertake the correct level of investment in such technology.

Certainly the tangible results of technological advance will be reflected in lower costs of exploration and presumably in higher profits to those private firms which combine exploration and extraction activities. Furthermore, new equipment can be patented and royalties secured from those patents.

Thus there does not appear to be any *a priori* reason to suspect that incentives within the private market will not call forth an economically efficient level of investments for the development of exploration technology. This assumes that those undertaking the investment can secure the benefits which it yields, through either patents, franchises, or entering into exploration activities themselves. Within the private sector, the services of a marine resource exploration organization will be hired by parties seeking net returns from the extraction, processing, and sale of marine minerals. Clearly, the tenure uncertainty of the *in situ* minerals will reduce expected net benefits from what they would be under secure tenure arrangements. The respective optimal levels of investment in exploration technology will accordingly differ.

In specific instances, there may still be a case for governmental intervention. For example, an exploration venture might yield public as well as private benefits, which together make the investment efficient, yet the private portion of those benefits prove insufficient incentive for it to be undertaken. In considering these investment opportunities in the aggregate, either some additional public incentive or joint public–private sponsorship of exploration technology development might be warranted.

Public participation also may be warranted if the amount of money required is so great that potential private development encounters capital limitation, if the risks involved are exceptionally high,[4] or if overall costs can be reduced by linking the development of exploration technology with other government programs.

Turning to that part of marine technology associated with mineral extraction, the same question needs to be asked: Is there a case for federal intervention? Prevailing technology and its attendant hardware will be employed in some form in any mineral extraction; yet the private incentives for developing this technology are dampened by the tenure ambiguity. Technical development, which reduces marine resource extraction cost, will enhance the value of extractable resources. If those resources are located on the Continental Shelf and owned by the government, the value of the public domain increases accordingly. Leasing arrangements conveying interests in those resources to private parties provide a way of increasing incentive for private development of a technology applicable to those particular resources. Such an arrangement has been proposed to facilitate private development of a terrestrial shale oil technology.

To the extent that a new extraction technology can be exclusively owned, it may be sold to those who can incorporate it profitably in the mining process. Under these circumstances, adequate economic incentives exist for private development of an efficient technology. If the resulting technology is not fully patentable, the individual may capture some of the benefits generated if he enters the resource extraction business himself, either as a mining operation or contractor thereto.

The fact that this technology has a payoff only when applied in actual mining operations stresses the need for policies which remove impediments to private development of marine resources when such development is economically efficient. If adequate security of tenure can be assured, private development will then ensue, and ancillary outlays in technology will have a payoff to private investors. To the extent that there is uncertainty about the status of property rights or the cost of their acquisition, there will be a tendency to underestimate the full potential benefits obtainable from the new technology.

Technological change for maintaining environmental quality

The waste-assimilative capacity of the environment was referred to earlier as an important stock resource, with the prospect for attracting considerable attention from economics[5] as well as from engineering.

Determining the use of this resource in the private market will result in external diseconomies unless waste residuals are eliminated in production and all relevant environmental attributes are included in private property rights which are exchanged in competitive markets. Since neither of these conditions holds, two economic problems emerge: (1) How should the assimilative capacity of the environment be allocated? and (2) What is the appropriate level of technological investment for developing new options for disposing of waste materials or recycling them?[6]

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[4] The corporate structure of enterprise is a device for sharing risk, but it does require a general public acceptance that the risk is worth assuming for the prospects of potential gain. This may entail a "learning period" for the accurate perception of risk associated with the investment in technological innovation.

[5] For an excellent conceptualization of this problem, see Ayres and Kneese [1]. Many of the notions introduced here are more fully discussed in this article.

Past investment in these technologies usually has been the result of specific public policy rather than private market behavior. Clearly, the through-put of new materials necessary to maintain a given level of production and consumption decreases as the technical efficiency of energy conversion and materials utilization increases. Similarly, the longer the usable life of cars, buildings, machinery, and other durables, the fewer raw materials are needed to compensate for loss, wear, and obsolescence—although the use of old or worn machinery tends to increase other residuals problems.

Not only can technology develop recycling procedures, or ways in which waste materials may be introduced into the environment, but also it may modify an environmental medium to improve assimilative capacity. This strategy is followed when reservoir storage is constructed to augment low flow which ordinarily would be associated with critical pollution conditions.

The total value of environmental assimilative capacity cannot be calculated. If we consider ourselves as living in a closed system with no assimilative and/or regenerative capacity (submarine or spaceship), all material resources would have to be recycled and the cost of all goods would necessarily reflect the cost of reprocessing residuals and wastes for reuse. The goods produced in a spaceship economy certainly would be different from those we currently produce. The difference in terms of welfare implications may well be very large, although we possess no methodological tools for quantifying it. Goods produced by high residual-producing processes, such as paper-making, would turn out to be substantially underpriced vis-à-vis goods which involve more economical use of basic resources. This cannot be claimed to be socially disadvantageous until the assimilative capacity of the environment is extremely scarce. When this happens, as is now the case in most highly industrialized regions, either a market must be allowed to operate or explicit decisions must be made permitting a rational choice to be made between curtailing or controlling the production of residuals and tolerating the effects thereof.

The production of residuals is not immutable and can be changed by investment in such things as material-processing technology and raw material substitution. At the present time there is little incentive in the price structure for eliciting optimal investments in this type of technology.[7]

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[6] This basically reduces the effluent volume discharged into the environment.

Policy Implications

The preceding discussion has examined the economic impact of technological change pertaining to the extraction and use of stock resources. The economic implications of technological advance suggest the need for occasional public participation in its development. Clearly, the details of such participation must be developed on the basis of an empirical examination of each particular situation. There are, however, several general propositions which one can set forth.

One of these is that the role of technological change pertaining to terrestrial mineral resources should be viewed within the context of a "regional mineral system." This simply suggests that the broad strategy for new technological investment should be determined by examining the extent to which the value of the mineral deposits of a region is enhanced. Technological advance in exploration, extraction, and processing has a relatively direct impact on the value of the regional mineral deposit. The consulting or "service" organization for mineral exploration activities is one way in which its regional benefits can be captured—especially if these services are priced according to the level of detail to which the information is developed and the area coverage. Other technologies, which may indirectly affect this value, have substantially greater impact on the producer of consumer goods or the processor of raw materials, and probably adequate private economic incentives exist for optimal investment in expanding those particular technologies.

This does not imply that one invests in any technology which enhances the value of the regional mineral deposit. It suggests that changes in this value appropriately reflect benefits derived from technological innovation, and the costs of securing such innovation should be evaluated in terms of those benefits.

One should also note that extractive technologies over the recent years have involved a substitution of capital for labor, and that further extension of these technologies will continue to have a displacement effect upon the labor force of the mineral industries. This consequence of technological change is of concern for public policy, requiring in some cases suitable programs to facilitate the relocation of displaced labor in the national economy. This is in no way an endorsement of arguments which have been effectively used by the labor unions to impede technological change in such areas as coal mining. The costs of such training and relocation programs as may be required simply reflect social overhead investments required of the general economy as production processes become more efficient and sophisticated.

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[7] These points are further elaborated in Ayers and Kneese [1].

A second policy generalization which is consistent with the preceding discussion relates to the difficulty of securing adequate investment in technology when the stock resource is not subject to clear-cut and legally defensible tenure. Under such circumstances, the route toward an optimal policy for technological advance probably lies in clarifying the tenure ambiguities of the resource rather than financing this advance by the federal government. If such a clarification is impossible, the level of technological development which could be considered "efficient" will be somewhat less than if those resources were subject to defensible proprietary claims by individuals and firms. In this case, an eventual breakthrough on the tenure problem would represent a parametric change in our efficiency model to which the level of investment in technology would subsequently have to be adjusted.

With respect to the stock character of the environment's assimilative capacity for wastes, investment in technological development can most usefully be explored within the conceptual framework of materials balance system. Opportunities for technological trade-offs between the relative physical magnitude of these end products of production and the technical opportunities for shifting the form of residuals materials need to be identified and explored. The fact that we are in many areas pushing the upper limits of assimilative capacity of the environment (particularly in metropolitan air-sheds and surface water systems) suggests that the economic value to society at large of perfecting these technologies is now considerable. In this connection it is important to develop improved measures of the external costs resulting from different concentrations and duration of residuals in the environment, as well as systematic methods for projecting emissions of external cost-producing residuals. As suggested earlier, there appears to be an appropriate public role in securing this information, in promoting the development of the technologies mentioned above, and in devising methods for putting them to use where desirable.

An additional area of needed technological expansion is that of waste recycling within the production enterprise itself. Changes in this technology will require specific efforts dealing with the particular production functions of the various industries involved. This probably can most efficiently be secured through private incentives such as effluent charges associated with the quality, quantity, and timing of industrial waste discharges.

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A Cost–Benefit Analysis of Ocean Mineral Resource Development: The Case of Manganese Nodules

PHILIP E. SORENSEN AND WALTER J. MEAD*

IN recent years, both popular magazines and scholarly journals have, in increasing numbers, heralded the imminent opening up of the "inexhaustible treasures of the oceans," leading some investment advisory services to conclude that ocean mining will be "the growth industry of the 1970's." At the same time, committees of the United Nations are studying the implications of ocean mineral exploitation for the underdeveloped nations, fearing the impending loss of major export sales and hoping to arrive at a "law of the sea" which protects these nations' presumed "natural right" to a basic inheritance of mankind. Is this optimism justified? And are there externalities connected with these developments of sufficient value that a case can be made for government inducements to growth? The present paper attempts to answer these questions by applying cost–benefit analysis to the most promising untapped ocean mineral resource, manganese nodules.

The Present Status of Marine Mineral Recovery

Although the oceans and the lands beneath them are potential sources of all minerals, only oil, natural gas, and sulphur are presently being produced in significant quantity. All other presently exploited ocean minerals, including tin, diamonds, sand, gravel, magnesium, bromine, and gold, represent less than 30 percent of the total value of mineral resources recovered from the ocean in 1964, estimated to be about $5 billion, one-third of this amount being attributed to U.S. production [6, p. 25]. At present the most important potential ocean mineral resources are phosphorite, a high-grade fertilizer available in great quantities on the continental shelves, and manganese nodules, porous, spherical concretions containing varying quantities of nickel, cobalt, and copper, which are widely distributed on the sea floor.

The relevant geographical areas from which a manganese nodule inventory is legally available for the United States are (1) the territorial waters over which states have jurisdiction, (2) the outer continental shelf beyond the boundaries of state jurisdiction to a depth of 200 meters, and

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PHILIP E. SORENSEN *is assistant professor of economics and* WALTER J. MEAD *is professor of economics, both at the University of California, Santa Barbara.*

(3) following the wording of the 1958 Geneva Convention on the Continental Shelf, "beyond that limit, to where the depth of the superadjacent waters admits of the exploitation of the natural resources of the said areas." Thus, all areas outside the 200-meter countour are at least potential mining sites if U.S. firms are able to demonstrate an operable production system.

The closest known manganese–iron oxide reserves lie at depths of 350 to 1,000 meters on the Blake Plateau off the southeastern coast of the United States, an area of about 1,800 square miles. These reserves, estimated to total 1.45 billion tons, contain 20.5 percent MN_3O_4, 15.8 percent Fe_2O_3, 0.43 percent nickel, 0.3 percent cobalt, and 0.13 percent copper [10, p. 49]. All of these concentrations compare unfavorably in ore grade with available land deposits or with Pacific Ocean nodules. Reserves of manganese nodules in the Pacific have been estimated to be as great as 1.7 trillion tons [12, p. 175]. Their average composition is estimated to be 24.2 percent manganese, 14.0 percent iron, 1.0 percent nickel, 0.35 percent cobalt, and 0.53 percent copper [12, p. 180]. The enrichment of the nodules with trace minerals is a function of depth, however, and those deposits of economic importance may be expected to lie at depths of from 12,000 to 18,000 feet.

Supply and Demand Conditions

The recovery and processing of manganese nodules will result in significant output of manganese ore, cobalt, nickel, and copper. The principal use of manganese is in steel production to counteract the effect of sulphur and to impart various qualities of strength and hardness. Known world reserves (about 2 billion tons) are large relative to annual consumption of 16 million tons. Since 1964, the price of manganese ore has doubled from $30 to about $60 per ton in recent quotations. Since the demand for the ore is derived from the demand for steel, and since "there is no satisfactory substitute for manganese in the major metallurgical uses and manganese as a metal has no uses of its own" [5, p. 570], the demand should be highly inelastic.

Cobalt has a wide application in the making of high-strength steel alloys. World production averages about 15,000 tons per year, one-third of which is consumed in the United States. Known reserves are over 3 million tons. Prices have trended downward from $2.60 per pound in 1955 to $1.87 in 1967. Although its own price elasticity of demand may be close to one, the fact that its uses substantially overlap those of nickel means that any joint decline in prices following manganese nodule recovery would result in a smaller increment in quantity demanded for either mineral than that estimated by the conventional formula.

Principal uses of nickel are in stainless steel, nickel platings, nickel alloys, and steel castings. World reserves are plentiful and widely distributed, totaling 70 million tons as compared to annual consumption of 400,000 tons, 45 percent of which is U.S. consumption.

Despite adequate reserves, the rapid growth in world demand for nickel since 1964 has resulted in shortages which have pushed prices from about 70¢ per pound in the decade before 1965 to 94¢ in 1968. A tight supply situation is expected to continue through 1970, but major new production facilities are now under construction, and these, together with continuing substitution of other metals for nickel in stainless steel, contribute to an expectation of stable or falling nickel prices after 1970.

Copper's major use is in the transmission of electricity, other uses being plumbing, automobile and home appliance manufacturing, and decorative and architectural applications. World copper production is expected to reach almost 7 million tons in 1968, of which the United States will consume some 30 percent. Estimated reserves of copper (270 million tons) are adequate, even in relation to the increased consumption levels expected in the next decades. The combination of a prolonged labor dispute in the United States and high military demand have caused extraordinary recent price increases for copper in free metal markets of the world. The present copper price (42¢) is not expected to persist beyond early 1969, however, because of excess stocks of copper scrap and loss of some part of the copper market to aluminum and plastics as a result of the strike. Technological advances in copper mining and processing have made it possible to mine ores containing as little as 0.3 percent copper in the United States, as compared to the 2-percent figure regarded as marginal fifty years ago [7, p. 62]. All these factors point to long-run stability in copper prices.

Private Costs and Revenues

In attempting to estimate the private costs and revenues which may be expected in exploiting manganese nodules as a resource, a massive information gap is immediately encountered. At almost every level of the production system, new and unknown processes must be applied, whose costs and operating characteristics can only be speculated upon. What follows, then, is not a listing of known engineering and construction costs for all parts of the system but instead the best available estimates, based upon history and analogy, drawn upon by government agencies and private firms and synthesized by the present writers. Where conflicts of opinion exist, we have generally sought to use conservative figures for costs at all stages in the total system and have likewise applied a conservative hypothesis concerning demand functions in estimating revenues.

Ignoring exploration costs, there are three connected production systems involved in manganese nodule exploitation: dredging, transportation, and processing. These systems will be described and cost estimates for them given separately. On the basis of the estimated proportions of minerals recovered from gross tonnage processed, a revenue estimate will be derived. The present value of the expected revenues will then be compared to the total investment required.

Dredging

There are no presently operative deep-water dredges; there are, indeed, no final engineering designs for such dredges, despite the profusion of fantasy models illustrated in various publications. As noted earlier, those manganese nodules of economic interest lie at depths of from 12,000 to 18,000 feet. To bring up materials from such depths will require a new hydraulic dredge capable of withstanding tremendous pressures, both from ocean depths and within the water column supplying the pressure differential. At the same time, the dredge line must be reasonably flexible, able to withstand current changes and adjust to the varying topography of the ocean floor. Despite attempts by promoters of ocean mining to explain away these difficulties, it appears that the deep-water dredge will require an order of creative engineering to date unknown in world mining. Attesting to the limits of present technology, a recent survey of available undersea mining equipment noted that suction dredges operate at depths of from 30 to 90 feet "but are being built to operate at depths up to 250 feet" [17, p. 112]. The adjustment of production techniques required to move to 18,000 foot depths is clearly not a simple, continuous function; it is a technological challenge of an entirely different order.

What will it cost to develop and produce a practical deep-sea dredge? Some experts confess that they don't believe such an engineering feat is within the financial capacity of any private firm; some say that a deep-water dredge simply won't operate.[1] Engineers at the Bureau of Mines express the belief that such a dredge could cost as much as $150 million.[2] When this figure was put to a managing engineer for one of the world's largest dredge manufacturers, he agreed to it only as a minimum estimate.[3] Further evidence of the magnitude of the required investment was given by a speaker at a recent oceanography conference, who used the figure $200 million as the amount a major mining firm has "agreed to commit" over the next decade in research, prototype construction, and final system construction for manganese nodule recovery and processing.[4]

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[1] They believe that the nodules will lodge in the joints of a flexible system—that only a vertical dredging column is capable of generating the required lift, and that a "telescoping" vertical column cannot be built to operate in this environment.

[2] Conversation with M. J. Cruickshank, Marine Minerals Technology Center, Tiburon, California, June 6, 1968.

[3] Conversation with K. W. Posselt, Standard Dredging, Inc., New York City, June 24, 1968.

[4] A confidential confirmation of this figure was given us by a consultant to the proj-

We believe it reasonable to conclude that the capital cost of the deep-water dredge required to recover 5,000 tons of nodules (net dry weight) per day (averaged over 360 days, on the hypothesis of 250 working days per year and 18 hours per working day of operations)[5] will be $150 million.[6]

In the absence of design specifications for the deep-sea dredge, operating costs can only be roughly estimated. Welling and Cruickshank note that large conventional dredges already require over 10,000 horsepower [17, p. 113]. We assume that the proposed system, with greater pressure requirements, using an underwater vehicle and possibly carrying a television camera on the ocean floor, would require a minimum of 15,000 horsepower. The power costs alone would then be in the neighborhood of $1.5 million per year (at 2¢ per operating horsepower hour). Conservatively estimated, additional costs of $7.5 million in operation and maintenance and $7.5 million in insurance[7] would bring the yearly operating costs of the dredge alone to $16.5 million.

Transportation[8]

Transport of manganese nodules will require an almost continuous movement of ore-carrying barges from the point of recovery to processing plants in the United States. The costs of operating this fleet can be more accurately estimated than were dredging costs, though the optimum ship design for this purpose is still unknown. Consideration of a number of alternatives has led us to conclude that the least-cost method of transport for nodules would be a system of barges, pulled by ocean-going tugs, and moving in a continuous cycle to and from the recovery site. Construction costs for the required barge (having an ore-carrying capacity of 10,000 short tons) is about $550,000. Annual maintenance costs of about 5 percent of original cost and insurance costs of 2.5 percent of insured risk per year could be anticipated. Ocean-going tugs of the type required may be chartered at $1500 per day, which we regard as a competitive exemplification of the total operating cost of such a vessel. The original mining sites are expected to lie in the South Pacific, some 4,000 nautical miles

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ect. He agrees with us that only a small part of this amount will be spent unless some major change in conditions of demand or supply takes place.

[5] Gross tonnage dredged would be much higher; water, sand, and silt would be screened out on the receiving barge. Cf. Webb [16, p. 12], who reports an average gross dredging rate of 2,340 tons per working day at depths of from 35 to 100 feet in sea diamond mining.

[6] Mero estimates the cost at $7.2 million [12, p. 270]; Brooks uses a figure of $100 million, including processing facilities [4, p. 35].

[7] Transport barges of the type required for the system carry a rate of about 2.5 percent of insured risk per year. Prototype undersea vehicles carry rates of 25 percent and higher, if insurance is available. (Communication from Royal Globe Insurance Company.)

[8] This section was written with the assistance of J. R. Paulling, Professor of Naval Architecture, University of California, Berkeley.

from the (expected) location of the processing plant (near Los Angeles). The speed of these vessels ranges between 9 and 11 knots. We therefore conclude that a fleet of 18 barges and 16 tugs will be required to complete the 180 round trips associated with one year's operation. A port facility with specially designed off-loading equipment will also be required, the cost of such a facility being about $5 million, with an annual cost for labor, maintenance, and power required for off-loading of about $1 million. Summing up, the transportation of manganese nodules will require an investment of $15 million and annual operating costs of about $10.5 million.

Processing

Manganese nodules are a true mineralogical phenomenon, and the best energies of a number of outstanding chemists and geologists have been devoted in recent years to unraveling the mysteries of their origin and geochemical properties. There is no way adequately to summarize the difficulties of extracting trace minerals from manganese nodules without entering into some discussion of complex chemical and mineralogical relationships such as oxide phases, lattice structure, and chemical reaction functions. It may be concluded, however, that the difficulties of selective leaching are such that no immediate or simple process of obtaining large proportions of the contained trace minerals from manganese nodules is now known or anticipated. Functional characteristics of the most commonly suggested process of extraction (using an acid leach) are described in detail by Hoover [8, pp. 29–64]. Despite his optimism, the acid leaching process has several apparent drawbacks: the dissolution of copper and nickel from the nodules takes an extraordinary length of time, requires an unacceptable quantity of acid as an input, and results in high cobalt dissolution only where the iron content of the nodule is low (less than 5 percent). The later separation of the cobalt from the nickel in solution, while theoretically possible, appears to be both difficult and expensive. Present indications are that technical and economic factors rule out acid leaching, direct smelting, sulphur dioxide leaching, and other direct reduction methods. A recent intensive study concluded that the most effective extractive method involves a reductive roast-ammonium carbonate leach process.[9] Using this process, the maximum percentages of contained minerals extracted (depending upon the presence of oxygen) were 75 percent Mn, 78 percent Fe, 85 percent Co, 90 percent Ni, and 10 percent Cu [15, p. 2].[10] The capital cost of a processing plant capable of handling 5,000 tons of manganese nodules per day is estimated (in this same study) to be $50 million. The estimated variable cost of processing nodules using this system is $30 per ton, although the figure could fall as low as $25 per ton in the future, as we have assumed in the cost calculations below.[11]

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[9] The study [15] was made at the Bureau of Mines Metallurgy Research Center in Salt Lake City. Further conclusions of the study have been reported to us by Mr. L Schack, director of this research.

[10] We have employed even larger recovery percentages in our revenue estimates, ac-

Employing the accepted estimate of the average proportions of contained minerals,[12] a plant processing 5,000 tons of manganese nodules daily (or 1,800,000 tons yearly) and recovering maximum percentages of the contained minerals would recover 585,000 tons of manganese-iron ore, 17,100 tons of nickel, 5,760 tons of cobalt, and 1,908 tons of copper.

If the present prices of these minerals are used as estimates of future prices, the annual gross revenue generated by the system is about $90 million. Yearly operating costs (combining the estimates developed above for the three phases of the system) total $72 million. Discounted at 6 percent, the present value of net operating revenue is about $99 million, as compared to a capital cost (discounted to allow for a five-year development period) of $175 million.[13]

When account is taken of the expected change in prices brought about by the increased supplies made available, the outlook is blacker still. In Table 1, current world production of the relevant minerals is compared with incremental outputs, and the proportions are then used to predict the percentage decline in market price which would occur if price elasticities of demand are assumed to be unitary for all outputs.

At these more realistic price levels, total revenue would fall to about

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counting for possible increases in efficiency: 85 percent for Mn and Fe, 90 percent for Co, 95 percent for Ni, and 20 percent for Cu.

[11] This is also the figure used by Mero [12, p. 272].

[12] For example, 24.2 percent Mn, 14.0 percent Fe, 0.99 percent Ni, 0.35 percent Co, and 0.53 percent Cu [12, p. 180].

[13] An appendix giving details of these calculations is available from the authors upon request.

Table 1. Expected change in prices of minerals as a result of increased supplies from marine recovery of manganese nodules

Mineral	Present world output	Increase in world output	Percentage increase in output	Percentage decline in price, assuming unitary elasticity of demand[a]
	thousand tons		*percent*	
Manganese ore	18,000	585.00	3.25	3.13
Nickel	450	17.10	3.80	3.67
Cobalt	15	5.67	37.80	27.43
Copper	7,000	1.90	Negligible	Negligible

[a] The actual elasticities, we believe, would be lower; the assumption of unitary elasticity is made for purposes of comparison only.

$81.6 million, the present discounted value of net revenue (at 6 percent) falls to $53 million, and the prospective capital loss becomes $122 million. At any higher rate of discount (which would approximate the degree of risk involved), the loss would obviously be greater still.

Social Costs and Benefits

Given this dismal outlook for profits in mining manganese nodules, why does the prospect continue to excite interest among a number of major American firms? We believe that there are two explanations. First, mining companies must, for defensive reasons, engage in sufficient individual research to assure themselves full knowledge of the economic potential of marine minerals which could eventually destroy their present markets [13, p. 182]. And second, it is widely believed that the United States (or even some foreign governments) may, in the near future, be willing to underwrite all or most of the basic exploration and prototype construction required for marine mining. Many firms are willing to enter the field under these circumstances and are presently preparing their credentials.

The likelihood of federal assistance to undersea mining in the explicit form now hoped for depends upon a number of political or international exigencies, but from a purely economic point of view should be based solely upon an evaluation of the social rate of return which might be expected on the investment involved. In a recent study [11, pp. 11–14], we have attempted to identify and give some order of magnitude to the major external costs and benefits associated with marine mining generally. For the specific case of manganese nodules, the principal external cost is likely to be associated with disposal of detrital materials in the ore beneficiation process at sea, which could have a major effect on the ecology of the area. The great distance of anticipated mining sites from inhabited areas obviates the additional forms of environmental pollution which would be observed in near-shore mining. Problems of disposal of wastes from processing plants on land and navigational hazards attributable to the mining and transport of the nodules are not unique to this industry, and recreation site destruction is unlikely so long as processing facilities are located in industrial areas. Thus, external costs peculiar to the contemplated system appear to be negligible.

There are, however, some significant external benefits: (1) pure research benefits flowing from enhanced knowledge of the ocean floor, (2) national defense benefits connected with increased engineering capability in the underwater environment and improved knowledge of undersea geology, and (3) technological spillovers, affecting follower firms in the same industry as well as firms in other industries.

The most important of the listed benefits is likely to be technological spillover effects. A new industry, employing radically different or complex technology, will experience a fall in production costs as it matures, both through physical improvements in the capital used and through greater understanding of the production process. For example, the deflated cost of producing rayon declined from about $1.15 per pound in 1930 to $0.58 in 1940 and to $0.38 in 1950 [11, p. 14]. The cost of sea water desalination by various methods declined from an estimated $10 per 1,000 gallons in 1960 to $1.15 in 1963, $0.80 in 1965, and $0.50 in 1968 [14, pp. 1, 16]. Nuclear power generating costs have similarly declined from about 50 mills per kwh in 1958, to 6.2 mills in 1962, and to 4.4 mills in 1964, a cost improvement for the most part attributable to the construction of larger generating units [2, p. 20; 3, p. 21]. Cost reductions flowing from rapidly changing technology are distinct from and in addition to what has been called the "learning curve," a reflection of increased operating efficiencies as workers accumulate experience in handling a new process in the context of a nearly constant technology [1, p. 87].

Some increase in the efficiency of transporting and processing manganese nodules attributable to both of these causes may be expected (and for the processing phase are allowed for in the cost estimates given above), but any dramatic improvements will likely occur in the manufacture and operation of the deep-water dredge. Second-generation dredges, engineered in the light of experience gained by the pioneering firm, may produce much higher recovery levels. It is impossible for such benefits to be completely internalized by patent protection, for neither knowledge diffusion nor imitative art can long be controlled. So it will pay to wait, to be the second or third firm in the industry. And, in time, firms in other industries which now use conventional dredges will similarly enjoy the benefits of a perfected technology for whose development they have not paid.

Thus the question is posed: Are the external benefits of deep-water mining sufficient that a reasonable case can be made for direct federal assistance? The analysis in our section on the present status of marine mineral recovery indicates that, under optimistic assumptions concerning demand elasticities and discount rates on expected net revenues, a manganese nodule mining system would, at present, result in massive capital losses. Furthermore, we see little cause for optimism that the prospect for profitability will improve in the next decade. The existence of large, untapped land-based reserves of all the contained minerals, together with continuing improvements in the technology of extraction and processing, make it unlikely that conditions of supply will force general price increases. Any revolutionary breakthrough in techniques of processing manganese nodules would immediately open up vast new reserves of low-grade ores on land, obviating the need for ocean mining. And there is no reason to assume that the estimated pioneering costs of a deep-water dredging system will fall in the future.

It is difficult to place values on the major external benefits of the system—technological spillovers to other industries, pure research benefits, and national defense benefits; but these values would not, in our opinion, equal the present cost to society of the investment required. We conclude that there is not, at the present time, a sufficient prospect of private or public reward for any major investment in manganese nodule exploitation to be economically justifiable. Continued defensive maneuvering by interested firms and widespread publicity which even now threatens ocean mining with "promotional overkill" should not distract us from recognition of cold, economic logic.

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Groundwater Utilization and Tax Policy

HERBERT W. GRUBB

SINCE the early 1950's, groundwater has been used to expand irrigation in the arid and semiarid regions of the United States. Present irrigation from groundwater supplies is concentrated in the western states, but some irrigation from groundwater supplies is found in the more humid parts of the nation. Although statistics are not readily available with which to estimate precise acreage irrigated from groundwater supplies, the groundwater resource appears to have become an important resource to agriculture, both in terms of expanding production of the drier climates and in terms of supplementing precipitation in other areas. In some of the arid and semiarid regions, groundwater is the most limiting economic resource in that groundwater is not present in sufficient quantity to permit irrigation of the available land resource. However, further exploration may result in the discovery of new groundwater deposits which would increase the physical quantity of the resource both in the vicinity of present irrigated areas and in areas heretofore not irrigated.

The discovery, development, and use of groundwater by irrigated agriculture has, in effect, resulted in an increase in productive capital. The overburden formerly classified as "dryland" cropland or "dryland" grassland can be shifted into irrigated cropland, or the underlying groundwater can be pumped and transported to other sites and put to several different uses, including irrigation. The purpose of this paper is to present discussion pertaining to major issues regarding effects of taxation upon the use and ultimate value of groundwater as a capital resource. The discussion will be centered around property taxes, as opposed to income, sales, or capital gains taxes. The form of the property tax under consideration is the ad valorem tax applied to assessed resource value.

Nature and Significance of the Groundwater Resource

In general, groundwater is classified as one of the natural resources; that is, most groundwater resources exist independently of man's activities. However, in some areas of California, groundwater aquifers are being used to store and transmit water which has been diverted from surface sources. The character of these groundwater resources is different from that ordinarily associated with a natural resource, since the overt actions of man are involved. In cases of this kind, water transfer costs, water price, and taxes may become involved in the single terminology of taxes. However, this situation does not affect the generalized conceptualization

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HERBERT W. GRUBB *is associate professor of agricultural economics at Texas Agricultural Experiment Station and Texas Technological College.*

of taxing policy, since direct aquifer operation costs and water prices presumably can be measured and hence separated for purposes of taxation.

Groundwater deposits range from those that are classified as stock resources to those that can be classified as flow resources. Groundwater deposits having natural periodic recharge equal to or greater than periodic withdrawal are considered as flow resources. Aquifers to which natural periodic recharge is less than periodic withdrawal are stock resources. The water deposit of the Southern High Plains of western Texas and eastern New Mexico is a stock resource in that there is not adequate recharge in relation to present withdrawals to prevent exhaustion within the foreseeable future.[1] The groundwater deposit in the Mesilla Valley near Las Cruces, New Mexico, has a source of recharge (the Rio Grande River and the network of irrigation canals which divert river water to the valley farmland) and thus this groundwater deposit has characteristics of a flow resource.

The different types of water deposits present different questions with regard to groundwater resource use and taxing policy. The flow resource should be utilized periodically (annually) to the extent that marginal cost equals marginal revenue; otherwise the economic value of the unused flows will be lost. On the other hand, a resource in storage, such as water in a nonrecharging aquifer, is available for use at a later production period and presents conservation questions about intertemporal allocation, given irrigation production prices and costs. The level and the form of the taxes upon groundwater affect the level of water resource use in the different production periods.

A significant factor which contributes to the importance of the economic allocation of groundwater resources is that a significant quantity of these resources is located in the sparsely populated counties of the arid and semiarid regions of the country. Because of the increasing cost of local government, from the standpoint of both the increased costs per unit of service and the increased quantities of services supplied, these local governments have a tendency to increase property taxes on farmlands and the associated water resources [2, p. 85].

The economies of rural areas depend upon use of land and water resources for employment, investment, and consumption. The effects of taxation upon groundwater use and the length of life of exhaustible groundwater reserves is significant to the present level of local area farm income, to local area economic activity, and to future local area economic growth. In addition, there are broader regional and national economic implications, since local areas contribute to national economic welfare and look to the national Congress for assistance in development of local area groundwater resources and resources associated with groundwater. The ultimate responsibility for any adjustments to use of the groundwater resources of an area and especially for areas in which groundwater will be exhausted will be borne by the state and national governments, either directly through investments in replacement resources or indirectly through the social cost of relocating and re-employing resources complementary to groundwater.

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[1] Various estimates have been made pertaining to the time of exhaustion of the aquifer. Under present annual use rates, some parts of the aquifer will be depleted within the next 20 years; other parts will be depleted in 50 to 60 years [5].

Tax Policy Issues

In order to approach questions of policy, the major goals and objectives must be known. Insofar as groundwater resource use is concerned, the public apparently has adopted goals similar to goals pertaining to other resources: that is, that development and use are desirable, that profit maximization is the objective, and that consumer and producer sovereignty shall be allowed to prevail. The groundwater resource is viewed as productive capital and will be utilized as a part of the collective wealth from which the community can benefit, through taxing either the current income derived from the use of the resource or the capital value of the resource.

Since groundwater is a natural resource, conservation questions arise. In an economic sense, conservation pertains to the time of use; and insofar as present goals seem to be concerned, the objective is to maximize present worth of the income stream produced by the resource, given market conditions and institutions. The manner of taxing and the amount of the taxes have a bearing on the rate of use of wasting our exhaustible resources, such as nonrecharging groundwater deposits.

The use to which resources are put is a major tax policy issue. Most tax legislation pertaining to the land resource includes terminology to the effect that the resource will be taxed as if it were put to the highest and best use. Presumably the same attitude is directed toward the groundwater resource. The attempt to direct resource allocation "en masse" through "highest and best use" clauses results in the protection of the taxing agency and does not necessarily result in optimum economic allocation, since optimum allocation can be made only by each individual resource user on the basis of applicable prices and technical conditions. "Highest and best use" is at best some kind of average which most likely fits no single individual but which is applied to all individuals.

Present Approach to Taxing Groundwater

In practically all cases, groundwater rights reside with the land overlying them, even though in most of the western states the appropriation as opposed to the riparian doctrine of water law is followed. In general, the water right is identifiable as a part of the land associated with it and therefore is classified as productive property in the form of irrigated land and is subject to property taxation by local and state governments and other local political subdivisions. The usual tax applied is an ad valorem tax on appraised value of the land resource, which in reality is two separate resources—land and water. Appraised value of land ranges from something called "fair market value" to estimates of capitalized net earnings plus other elements of expected appreciation or anticipated depreciation of future value. However, as a result of different viewpoints with respect both to time preference for income and to risk—that is, as a result of differences in the capitalization rates among the buyers and sellers—sales price value and capitalized earnings may be quite different.

Appraisal method for taxing purposes varies among the different states and also among the local administrative entities which levy and collect the taxes. The methods range from simple surveys of recent sales records to complete analyses of income earnings. The expected future income streams are based on historic yield and price data, on current yield and price data, or on expected future yield and price data. The appropriate estimate of present worth of future income streams is based on expected future technical input–output relationships and expected future prices; however, trends of past prices, yields, and costs are no doubt used rather heavily in making estimates of present worth of future income streams.

The nature of the expected future income from a producing asset, such as irrigation water, is of major importance in estimating the capitalized value of the asset, for taxing as well as for asset-trading purposes. Appraisal firms and local tax assessors have appraised land irrigated from exhaustible groundwater aquifers, for tax purposes, as if the water supply were endless and the income from irrigation water would never be expected to cease, when in fact the end of the water supply could easily be foreseen.[2] In 1967, in Curry County, New Mexico, present estimated net income to land and irrigation water was capitalized into perpetuity. The best available estimates showed that in some sections of the county the water supply would support the net income stream used in the calculation for only 10 years, and in no subarea of the county would the water supply support the net income stream of the calculation for more than 35 years. Thus, the capitalized values on which taxes were to be collected was in error by the amount of the difference in present worth of a future net income stream held constant at the 1967 level and the present worth of a declining future annual net income stream. A given ad valorem property tax placed on an erroneously high capitalized net income stream results in a higher tax than would have been the case had the tax base been correctly evaluated.

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[2] *The Farm and Ranch Owners Association of Curry County, New Mexico*, v. *The Commissioners of Curry County, New Mexico*, Clovis, New Mexico, May 1968.

In addition to property taxes on the basic land and water resources, state laws permit the levying of an ad valorem property tax on irrigation equipment such as sprinkler systems. Usually these types of equipment are installed either to permit the irrigation of land which cannot be watered by other, less capital-intensive irrigation techniques or to decrease the quantity of water input per unit output. Such investments are a form of capital substitutions for the groundwater resource.

Effects of Alternative Taxes upon Allocation of Groundwater Resources

The effects of alternative taxes upon resource allocation, the level of resource employment, and the level of output have been discussed by economists in the past. Contemporary writers have explored tax topics in light of present economic structure and present competition for resources. The eminent S. V. Ciriacy-Wantrup has devoted considerable attention to the effects of alternative taxes upon natural resource conservation [4]. Raleigh Barlowe [1, 2], Roland Renné [6], and others have also given attention to the tax question in relation to natural resource use. Writers of texts on economic theory deal with the influence of taxes upon resource use, output, and pricing. The relevant theoretical concepts applicable to analysis of effects of alternative taxes upon groundwater use are summarized below.

In cases where property taxes are placed on groundwater resources in the form of an ad valorem tax on the capitalized expected future earnings of irrigated land, the tendency will be to cause owners to attempt to redistribute use of exhaustible groundwater resources in the direction of the present [3, Chap. 13]. The reason for this intertemporal resource allocation is to avoid recurring property taxes on future net incomes by reducing the number of future periods in which income will be received. The forward shift will be practiced as long as discounted savings in taxes exceed the decrease in present worth of future net revenues resulting from shifting groundwater use forward in time. The final outcome of an accelerated groundwater use policy designed to avoid taxes is the exhaustion of the reserves and a shift in land use back to dryland more quickly than would have been the case under zero property taxes on the water resource or the use of a tax which varies with water use, that is, a tax per unit of groundwater pumped.

The per-unit resource input tax is an annual variable cost which tends to discourage annual resource use since it shifts the annual resource supply curve upward. A per-unit input tax means that unit resource cost is higher for each level of use and total annual tax varies with quantity used. Thus, for given demand situations the per-unit input tax reduces annual use whereas an equivalent ad valorem tax based on the value of the resource results in greater resource use. In the former case, the annual supply curve is shifted upward by the amount of the tax. In the latter case, the annual demand curve is shifted upward by the difference in discounted tax savings per unit and discounted reductions in present worth of future income, as a result of using an additional unit of resources in year i as opposed to waiting until some later year (year $i + t$). The greater the tax savings, the greater the shift in the annual demand curve; but because of declining marginal productivity from additional units of resource used in time period i, the shift in the annual demand curve is larger at low levels of use in period i than at high levels.

The form in which taxes are levied affects the intertemporal allocation of groundwater, the value of the resource (measured in terms of present worth), and the size and distribution of the "induced" and "stemming" effects upon local economies. These latter effects are of direct concern to local taxing authorities since the economies resulting from groundwater resource use will likely be organized and planned as if the groundwater resource were expected to last forever. Thus, tax authority may indirectly influence the ultimate size of the economy associated with groundwater use by influencing the annual rate of use of the groundwater resource.

The irrigation-associated economy is itself an object of property taxation and as such can be considered an asset to tax-supported entities. Annual ad valorem property taxes on agricultural marketing firms, agricultural input supply firms, and wholesale and retail firms are presently levied on the basis of either undepreciated construction and installation costs or a combination of undepreciated investments and annual net earnings. The generalized tax policy must, of necessity, be designed to treat the separate ownership entities equitably whether taxes are levied on the basis of services rendered or on the basis of ability to pay; but account should be taken of the extended effects of taxes placed upon basic resources such as groundwater.

The form of the tax will either hasten or delay the time at which local economic adjustment to a disappearing water supply must be made, by the manner in which the tax influences the rate of use of the basic resource. Other things being equal, a per-unit resource use tax results in a lower annual use rate than an annual lump sum ad valorem property tax. Although a lower annual use rate of groundwater results in a smaller effect upon the general economy (in terms of investments in property to service irrigated agriculture) than the general economic investments resulting from a more rapid use rate under fixed annual property taxes, the latter effect will be shorter-lived and probably will not be designed so as to be completely depreciated or used at the time of exhaustion of the groundwater supply. Not only will the tax base decrease when groundwater is exhausted, but also the adjustment process may include the abandonment of a significant quantity of productive capital in the service in-tion of other resources. If taxes are to be levied on the basis of present worth of the resources, then accurate estimates of present worth of the groundwater resource should be sought.

Tax incentives could be used to encourage investments in water-saving capital items such as irrigation sprinkler systems and recirculating systems for cooling water. The present practice in the irrigated areas is to tax these types of inputs just as tractors, farm machinery, buildings, and pumps are taxed, even though such investments represent an attempt to reduce the quantity of water per unit of output and extend the life of exhaustible groundwater supplies. In order to avoid or reduce property taxes on water-substituting inputs, either the owners do not make the investment or, once the investment is made, the incentive is to still speed up further the rate of annual water use and either fail to replace such equipment when its useful life is ended or proceed to salvage the remaining useful investment when the groundwater is exhausted. Such tax incentives could range from zero property taxes on groundwater-substituting inputs to property tax credits and accelerated depreciation schedules.

Summary

The groundwater resource is identified as a part of the land resource for taxing purposes. The application of fixed annual taxes to groundwater of the type used in taxing land tends to shift the use of exhaustible groundwater deposits forward in time. A specific policy which treats groundwater as an individual resource is needed in order to permit taxing so as to enhance rather than reduce the economic value of groundwater resources. The type of tax indicated is a tax per unit value of water used as opposed to a fixed annual tax based on the total value of the resource if the tax is to be neutral insofar as water allocation is concerned.

The adoption of tax incentives applicable to water-substituting capital investments would be expected to contribute to prolonging the useful life of exhaustible groundwater aquifers. Such measures would be expected to benefit local economies dependent upon groundwater resources through increased local investments in the short run, through extension of the useful life of the water supply, or through a larger total output from water and the increased capital input.

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Discussion: Economics of Stock Natural Resource Use

B. DELWORTH GARDNER

Whoever planned this session apparently anticipated that these three papers would relate in a unique way that would permit a single discussant. If so, the plans seem to have gone awry. About the only thing the papers have in common is that they deal with "stock" resources, and even here, Dr. Grubb's water aquifer, mistakenly I think, is treated as a flow resource if the rate of replenishment exceeds the rate of discharge. In general, the level of theoretical abstraction as well as the substantive issues treated in the three papers are highly disparate. Notwithstanding, in my opinion, all the authors have taken reasonable approaches to their respective subjects. I do not think it would be especially fruitful to compare or relate the papers to each other; rather, I will discuss each one on its own merits (or demerits).

Let me begin with the scholarly paper written by Dr. Brewer. The title suggests that economic, technologic, and policy issues will be treated. Almost all the substantive material in the paper deals with technologic considerations, which, however, are analyzed from an economic point of view and suggest some policy implications. In fact, Brewer's decision to focus mainly on technologic factors was wise, since other economic problems of optimal rates of extraction of a stock resource, the scale of optimal investment, and relationships between price paths and the rate of interest have been thoroughly discussed by Gaffney, Scott, Herfindahl, and Vickrey in the recent volume to which Dr. Brewer referred [MASON GAFFNEY, ed., *Extractive Resources and Taxation*, Madison, University of Wisconsin Press, 1967]. Brewer's paper is a welcome supplement to that volume because he considers a set of issues not treated in that book—namely, how technological advance at various levels of exploitation and utilization of stock resources impinges on resource owners.

His notion that problems of pollution and environmental quality constitute a special case of the stock resource problem is an exciting new concept that should yield fruitful results.

I appreciate the careful way in which Brewer sets up his model for a

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B. DELWORTH GARDNER *is professor of agricultural economics at Utah State University.*

mining situation so he can analyze the impact of technological advance. The model might have been extended, however, to cover one more factor that seems to me to be highly important—the degree of market perfection. He is quite right in stating that, if technological advance occurs at the processing stage or at the consumer goods production stage, "rents" received by the miner will depend on what effect the advance has on the price of the raw material. This is turn will depend largely on whether the processor and the producer of consumer products buy and sell in competitive markets. If they are monopolists, their quantity responses to cost curve shifts produced by technological advance may be far less than if they produce in competition. On the other hand, if they are monopsonists in raw material purchases, they will not be forced to pay the full increase in the value of marginal product produced by the technological advance. Hence, the conclusion that the price received by the producer of the raw material is importantly influenced by market conditions.

Let me say that I quite agree with Brewer's emphasis on tenure problems and his treatment of the possible justification of governmental intervention in cases where externalities warrant it.

In summary, I believe Brewer's paper to be an important addition to the "inexhaustible" literature on "exhaustible" resources.

I am ambivalent about the Sorensen–Mead paper. I enthusiastically applaud their empirical efforts to produce numbers that will suggest whether a proposed development should be undertaken. Such an endeavor does require courage, since discussants and other people often make quite a sport of toppling structures built upon shaky empirical estimates. But surely this is the desirable road to progress—getting estimates out where they can be appraised, criticized, and improved as we gain knowedge and experience. But, if manganese nodules constitute "the most promising untapped ocean mineral resource available," as the authors claim, and if we accept their feasibility analysis, then we had better forget about any unfound treasures allegedly waiting for us in the deeps.

The fundamental question I would ask is this: Are not the areas of technological uncertainty so overwhelming as to preclude any valid conclusion? I suppose that, so long as the conclusions are negative with respect to the feasibility of development, even with some liberal allowances for the possibilities of technological breakthroughs, then the costs of speculating may not be as high as if the conclusions were positive. But considering the complete absence of knowledge concerning deep-water dredging, as well as the present lack of a feasible extraction method, how relevant is it then to proceed with detailed cost estimates of other components of the total process?

A few more specific questions beg for some clarification. It is not clear why the closer and more shallow deposits of nodules in the Atlantic were dismissed so quickly in favor of the remote Pacific deposits. All Sorensen and Mead say is, "These concentrations compare unfavorably in ore grade with available land deposits or with Pacific Ocean nodules." Does this mean that there are land deposits which are superior to the Atlantic nodules in all the minerals in question and that mining and transport are less costly from land than from the Atlantic? In the case of the Pacific nodules, three minerals are important: manganese iron ore (39 percent of the total revenue), nickel (36 percent), and cobalt (24 percent). Further, in comparing the Atlantic and Pacific nodules, two issues might be crucial: (1) the dredging problems of 350 feet might be far less formidable than those of 12,000 to 18,000 feet, and (2) transport cost in the case of the Pacific nodules is about 40 percent of the operating costs of dredging and transporting. Therefore, the saving in transport distance and dredging at shallower depths, if Atlantic nodules were mined, would have to be set against the increased costs of dredging nodules inferior in ore content, transporting them to the processing plant, and processing them. Perhaps the Atlantic nodules are not competitive, but the reason for their dismissal is not clear from information given in the paper.

Regarding the external benefits from development, I too would very much question whether enhanced knowledge of the ocean floor or national defense benefits can be pushed very far as justification for public development. I can see relatively good possibilities for "technological spillovers" but question the evidence that Sorensen and Mead present. It is certainly possible that substantial experimental resources will have to be expended to develop a deep-water dredge, for example. Second and successive firms entering the industry may be able to cash in on this knowledge in some way. What I object to is pointing to a few industries which employ "new and complex technology" and which have reduced costs as they matured as evidence that this example necessarily will be followed by ocean mining. Other industries where uncertainty was great have experienced even greater costs than were anticipated. The rayon, desalinization, and nuclear power industries reduced costs primarily by economies of scale as they matured. It is difficult to see how this could be done in nodule exploitation once the industry was in full operation. Presumably Sorensen and Mead estimate their costs not for an infant but for a mature industry. Hence, it seems redundant to argue that there might be reductions in cost as the industry matures. I really regret having to throw icy water on the one possibly optimistic note in an otherwise dismally pessimistic analysis.

Finally, considering Brewer's emphasis on tenure security, I was more than a little surprised to find not one reference to this problem in the Sorensen–Mead paper. Surely, if all else were favorable, common access of many nations to the nodules, once the technology was known, would render development unprofitable in the long run. We have so many examples—the international fishery, petroleum, public grazing, groundwater—where all "rents" are wiped out by uncontrolled development. International agreements guaranteeing exclusive developmental privileges seem an imperative prerequisite to any development.

To summarize, with the possible exception of unforeseen favorable technological breakthroughs in dredging and processing, the authors' pessimistic views about the feasibility of ocean mining seem to be most tenable at the moment.

It is my opinion that Dr. Grubb has selected a problem area of considerable gravity and he faithfully follows the topic as suggested by his title. This is hard on a discussant, since he must evaluate the argument of the paper rather than carp about extraneous matters that appear but don't belong, or alternatively fret about all the material that should have been included but wasn't.

Let me restate what seems to be Grubb's principal argument. The usual tax applied to land irrigated from an aquifer is an ad valorem tax on the appraised value of the land, which value really incorporates two separate resources, land and water. Appraised value ranges from something called "fair market" value to estimates of capitalized expected future net earnings. Grubb's conclusion is that the imposition of the tax will shift water use from the aquifer in the direction of the present. This is logical because the number of times the net earnings of a given year will be taxed depends on their distance in the future. The present value of the property, therefore, will be maximized by shifting the time pattern of water exploitation toward the present. This produces the intertemporal misallocation which Grubb alleges. So far, so good.

What we would like is a tax which is neutral in its allocative effects, both with respect to allocation of water over the course of time and with respect to optimal proportions of factors (including water) in the input mix.

As a replacement for the property tax, Grubb advocates a per-unit tax on water actually used. He argues that water ought to be separated from land so that it can be taxed directly and separately from the land. The water tax then would not have to be paid unless water were used. This type of tax would shift the cost curves of water use upward, thus reducing annual use and prolonging the life of the aquifer.

Again, I agree completely with Grubb's analysis that the per-unit water tax would produce a prolongation of the aquifer's life, but is this desirable?

Grubb's per-unit tax is simply a case of the well-known severance tax. The severance tax is anything but neutral. Because the water cost curves rise by the amount of the tax, the tax discriminates against water, and a smaller than optimal quantity enters the input mix. This also results in a temporal misallocation of water toward the future. Therefore, the severance tax should also be rejected if other, more efficient, taxes can be found.

The question of finding a neutral tax is thoroughly discussed in the volume edited by Mason Gaffney, referred to earlier. Chapters by Steel (pp. 233–268), McDonald (pp. 269–288), and Vickrey (pp. 315–332) are especially relevant. The consensus of this group is that an income tax is practically neutral if the burden of the tax cannot be shifted forward, a probable situation in the case of irrigated agriculture. The value-added tax is also neutral since it does not induce substitution of one factor for another, leaves the interindustry allocation of resources unaffected, and does not misallocate intertemporally. Therefore, if the issue of the choice of tax is one of neutrality (as I believe is the complete focus of Grubb's paper), then the income tax and the value-added tax are superior to either the property tax or the severance tax.

Of course, one can argue that increasing the life of the aquifer is desirable from a social viewpoint because of various types of externalities not seen by the profit-maximizing firm. This is an entirely different supposition, and I can find no evidence in Grubb's paper that his argument is being made on these grounds.

WATER RESOURCE ECONOMICS

CHAIRMAN: WILLIAM LORD, UNIVERSITY OF WISCONSIN

An Efficient Program of Water Resource Development in a Framework of Growth and Trade

PINHAS ZUSMAN AND IRVING HOCH

WATER resource development programs frequently involve a commitment of vast economic resources for long periods of time, thus giving rise to significant interactions with the growth of the economy and its pattern of trade. Decisions concerning investment programs in water systems, therefore, must be taken with reference to the general capital formation process, anticipated technological changes, population growth, demand behavior, present and future trade opportunities, interregional resource movements, and expected changes in the industrial composition of output and income.

Hitherto, economic evaluations and analyses of these relationships have been mostly in the form of a cost–benefit analysis in which market prices and interest rates have served as indicators of consumer preferences, production constraints, and trade opportunities. A benefit–cost analysis is based essentially on a partial equilibrium approach dealing primarily with inputs and outputs closely related to the water resource system. Relations with more remote sectors of the economy are assumed to be reflected in the prices used in the analysis.

Several economists have stressed the idea that optimal public investment programs should be defined with reference to the objective functions of policy-makers, and that this should be represented in the benefit–cost analyses [4, 7, 8]. Specifically, a benefit–cost analysis is conducive to an optimal water resource development program if the prices (and interest rates) used in the analysis correspond to the shadow prices and interest rates associated with the maximization of the policy objectives under the prevailing constraints. It is widely accepted that, in a fully employed and competitive economy, market prices in effect may satisfy this requirement. However, it is also generally recognized that market imperfections, externalities, and other distorting factors may create significant divergences between observed market prices and the appropriate shadow prices. Furthermore, since water resource development plans ordinarily span long time periods, forecasts of future prices must be used in addition to current ob-

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PINHAS ZUSMAN *is senior lecturer in agricultural economics at the Hebrew University of Jerusalem and a visting associate professor of agricultural economics at the University of California, Berkeley.* IRVING HOCH *is a research associate with Resources for the Future, Inc.*

served prices. This calls for some predictive mechanisms which are not necessarily independent of the water development program itself. An alternative approach would be based on a general equilibrium analysis in which water resource development programs are embedded in a more general economic development plan.

The role that such general and rather simple optimum growth models may perform in providing guidelines was recently demonstrated by Arrow [1].

The present paper represents an attempt to approach the problem of water resource development in the state of California via a general equilibrium analysis which considers all sectors of the economy simultaneously. Capital formation, trade opportunities, consumption behavior, and technological changes are explicitly taken into account. However, the extensive nature of the analysis is not costless, and relevant information concerning important features of the water system has to be sacrificed.

At this point we should like to emphasize two important properties of the model stemming from the explicit incorporation of trade opportunities in the model.

First, notice that trade may bring about a separation between the state's resource endowment and its prices, the latter becoming dependent on technological relations and the given prices of traded goods alone. This is due to the operation of a mechanism underlying the "factor price equilization" theorem of international trade. Within certain limits, the value of water and other systems' outputs, therefore, may be independent of the quantities supplied.

Second, trade opens up the gate for interregional flows of capital. Under certain circumstances, this possibility may profoundly affect the structure of the optimization problem, since a principal decision variable is thereby introduced.

The Model

General characteristics

The objective of the present study is to determine an optimum program of trade and investment, including investment in water resource systems, for the state of California. To this end, the state's economy is represented by a Leontief-type model consisting of 32 principal sectors (including the federal, state, and local governments) and four sectors related to water supply and irrigation activities.[1] The planning period is 1955 through 1961—that is, planning is carried out for a past period. This period has been selected in order to allow a comparison with the actual performance of the economy. The study, therefore, should be viewed primarily as an experiment in planning methods. Nevertheless, interest in this kind of analysis transcends its importance as a planning technique inasmuch as it sheds light on the actual growth and trade processes and provides a norm for historical economic comparative studies.

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[1] The principal sectors are based on Martin and Carter's classification (UC classification) [9].

Factors related to the location of economic activities were ignored, and the economic sectors are state aggregates.

The model is structured as a dynamic linear programming problem in which existing capital capacities and available primary resources serve as constraints. The first are expanded through investment activities; the latter vary exogenously.

The structural relations

Balance equations.—The flow of goods and services in the economy is described by the following set of balance equations (expressed in matrix notation):

$$(1) \qquad X_t + M_t = AX_t + C_t + E_t + I_t,$$

where

$X_{t(n\times1)}$ is gross domestic outputs (GDO),
$M_{t(n\times1)}$ is imports,
$C_{t(n\times1)}$ is consumptions,
$E_{t(n\times1)}$ is exports,
$I_{t(n\times1)}$ is net investment (by industry of origin), and
$A(n\times n)$ is a matrix of gross technical coefficients (inclusive of replacements).

The index t refers to the time period (year), and $n=36$. X_t may be partitioned as follows:

$$X_t = \left[\begin{array}{c} X_{1t} \\ \hline X_{41,t} \\ X_{42,t} \\ X_{43,t} \\ X_{51,t} \end{array}\right]$$

where

$X_{1,t(m\times1)}$ is the GDO's of the principal industries (measured in thousands of dollars), $m=32$,

$X_{41,t(1\times1)}$ is the GDO of the water supply industry in operation in 1954 (measured in acre-feet),

$\begin{pmatrix} X_{42,t} \\ X_{43,t} \end{pmatrix}_{(2\times1)}$ is the GDO's of water-supplying industries to be developed after 1954 (measured in acre-feet), with industries numbered in an order of increasing cost, and

$X_{51,t(1\times1)}$ is the GDO of "irrigated land" (measured in acres).

The $n \times 1$ vectors M_t, C_t, E_t, and I_t can be partitioned in exactly the same way as X_t.

The matrix, A, of gross technical coefficients, accordingly, may be partitioned as follows:

$$\begin{bmatrix} A_{11} & A_{1,41} & A_{1,42} & A_{1,43} & 0 \\ \hline A_{41,1} & 0 & 0 & 0 & 0 \\ \hline 0 & 0 & 0 & 0 & 0 \\ \hline A_{51,1} & 0 & 0 & 0 & 0 \end{bmatrix}$$

where

$A_{11(m\times m)}$ is a matrix of gross technical coefficient of the principal industries,

$A_{1,41(m\times 1)}$ is the gross technical coefficients of UC41, the 1954 water-supplying industry,

$[A_{1,42} \mid A_{1,43}]_{(m\times 2)}$ is the gross technical coefficients of future water-supplying industries,

$A_{41,1(1\times m)}$ is the water coefficients of the principal industries measured in acre-feet per thousand dollars, and

$A_{51,1(1\times m)}$ is the irrigated land coefficients of the principal industries measured in acres per thousand dollars.

Gross technical coefficients are inclusive of replacement.

Import equations.—Imports are decomposed into two components: (*a*) induced noncompetitive imports and (*b*) controllable competitive imports. Induced imports are assumed to be proportional to the GDO's. In matrix notation,

$$M_t = MX_t + M_{ct}, \tag{2}$$

where

$M_{ct(n\times 1)}$ is controllable imports, and

$M_{(n\times n)}$ is a matrix of propensities to import.[2]

To simplify the analysis, it was assumed that, depending on the 1954 conditions, each sector is, exclusively, either an export sector, an import sector, or a nontrading sector. In addition, exports of some sectors were assumed to depend on exogenous factors alone.

The export–import relation serves also in simplifying the relationship among the auxiliary water industries. Since the principal sectors of the economy purchase water only from the water industry operating in 1954, which has a restrictive capacity, water transfers from the other two water industries are allowed by defining a "water trade" relation,

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[2] All noncompetitive imports are included in one sector—UC 28. The elements of row 28 in A are all zero, while in M, all elements, excluding those in row 28, equal zero.

$$M_{c,41,t} - E_{42,t} - E_{43,t} \leq 0. \tag{3}$$

Balance-of-payment identity.—The annual increment in the outstanding debt of California's residents to non-Californians consists of two major components: (*a*) the deficit on current account—import surplus plus net interest payments to foreign creditors—and (*b*) unilateral capital transfers associated with the influx of immigrants into the state. That is,

$$D_t - D_{t-1} \equiv V'MX_t + V'M_{ct} - V'E_t + rD_{t-1} - H_t \tag{4}$$

where

D_t is the outstanding foreign state debt at the end of year t;

$V_{(n\times 1)} = (v_i)$, with $v_i = 1$ for principal industries and $v_i = 0$ for $i = 41$, 42, 43, and 51;

r is the interest rate on outstanding foreign state debt, and

H_t is unilateral capital transfers to California.

Income and comsumption relations.—The net state income, Y_t, is

$$Y_t = U'X_t - rD_{t-1}, \tag{5}$$

where $U_{(n\times 1)}$ is a vector of net household incomes, exclusive of depreciation and indirect taxes, per unit GDO.

Household consumption behavior is represented by the following set of linear consumption functions:

$$C_t = C_0N_t + CY_t, \tag{6}$$

where

$C_{0(n\times 1)}$ is a vector of constants,

N_t is the population size, and

C is a vector of constant marginal propensities to consume.

Per capita consumption, therefore, is assumed to be linear in per capita income.[3]

The capital formation process.—Let $I^0_{t(n\times 1)}$ be the vector of investments in the various industries and $K_{t(n\times 1)}$ the stocks of capital constituting the industries' productive capacities at the beginning of the year. The capital formation process is then given by

$$\begin{aligned} K_t &= K_{t-1} + I_{t-1}{}^0 \\ &= K_1 + \sum_{j=1}^{t-1} I_j{}^0. \end{aligned} \tag{7}$$

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[3] The consumption functions of public services (UC 31 and UC 32) are, in effect, personal tax functions. The level of direct and indirect taxes is, thus, endogenously determined according to 1954 tax rates.

Equation (7) assumes a uniform gestation lag of one year. The demand for capital goods, by industry of origin, generated by the investment activity is represented by the relation

$$(8) \qquad I_t = WI_t^0;$$

where $W_{(n\times n)}$ is a matrix with constant coefficients. Elements in each column of W add up to one.

Restatement of the balance equations.—By inserting (2), (5), (6), and (8) into (1) and allowing for the possibliity of free goods, we obtain

$$(1') \qquad TX_t \geq C_0 U_t - rCD_{t-1} + WI_t^0 + E_t - M_{ct},$$

where $T = I + M - A - CU'$.

The primary resources constraints.—Restrictions on output due to scarce primary resources are introduced into the model by the inequality

$$(9) \qquad RX_t \leq Z_t,$$

where

$Z_{t(p\times 1)}$ is available primary resources, and

$R_{(p\times n)}$ is a matrix of resource requirements measured in resource units (acres, acre-feet, employees, etc.) per unit GDO.

The list of primary resources consists of total cropland, irrigable cropland, total civilian labor force, nonfarm labor force, and potential water deliveries by the individual water industries. Since water industries are arranged in an order of increasing cost, a stepwise cost function for water supply can be constructed

Capital capacity constraints.—The output of each industry is restricted by the stock of capital invested in it. The capital capacity constraints are given by

$$(10) \qquad LX_t \leq K_t,$$

where $L_{(n\times n)}$ is a diagonal matrix of capital/output coefficients.

By inserting (7) into (10) we obtain

$$(10') \qquad LX_t - \sum_{j=1}^{t-1} I_j^0 \leq K_1.$$

Nonnegativity constraints.—Clearly, we must have

$$(11) \qquad X_t, I_t^0, E_t, M_{ct} \geq 0,$$

while the sign of D_t is unrestricted.[4]

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[4] Negative values of D_t signify claims by California residents on foreign assets. The linear

Technological change.—Improvements in technology were introduced by downward adjustments in the coefficients of A and R. Capital coefficients were assumed constant over the course of time.

The objective function.—Distributional and noneconomic policy objectives are ignored in the present analysis. Given this simplification, it was suggested that an appropriate objective function may consist of the present value of future consumption streams discounted at the "social rate of interest" [7, 8]. However, this approach presupposes a knowledge of the social rate (presumably lower than the market rate). Furthermore, with finite planning horizons, one also faces the problem of how "end conditions" (terminal capital stocks in the present study) will affect consumption in the years following the planning period. Lacking information on the social rate and being unable to deal with the postplanning period, we had to settle for an objective function which will yield an efficient, though not necessarily optimal, development program. This concept deserves some further explanation.

Consider the set $S(K_1)$ of capital capacity configurations attainable at the end of the planning period (beginning 1962), given the initial capital capacities K_1 and the structural relations and restraints. That is, $S(K_1)$ is the set of feasible terminal capital capacities. A configuration is efficient if it is feasible and if no other feasible terminal configuration exists with a greater capital capacity of at least one sector and no smaller capital capacities of any other sector. Let $E(K_1)$ denote the set of efficient configurations of terminal capacities. Our objective is to find an efficient program—that is, a program leading from K_1 to $E(K_1)$. In addition, we want the ratios among terminal capacities to conform in some sense to the general trend of the state's economic growth. To this end we define an additional variable, X_0, and add the constraints

$$X_0 g \leq K_1 + \sum_{T=1}^{T} I_T{}^0 \tag{12}$$

and

$$D_T - g_D X_0 \leq 0, \tag{13}$$

where

$g_{n\times 1}$ is a vector of desired ratios among terminal capital capacities,
g_D is a coefficient determining the permissible debt ratio, and
T is an index representing the planning horizon.[5]

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programming formulation of the problem thus required the definition of foreign debt and foreign credit as two distinct activities.

[5] Values of g and g_D were determined on the basis of 1954 estimated capital capacities modified in accordance with expected changes in exogenous exports and prevailing trends in consumption behavior.

To find the desired efficient program, maximize X_0 with respect to X_t, I_t^0, M_{ct}, E_t, and D_t $(t=1, 2, \ldots, T)$ subject to (1′), (3), (4), (9), (10), (11), (12), and (13). The approach is illustrated in Figure 1.

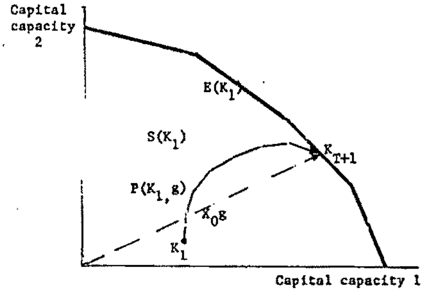

Figure 1. Geometric illustration of an efficient program

The heavy line represents the set of efficient terminal capacities; X_0 is the ray through the origin, and $P(K_1,g)$ represents the path associated with the efficient program and depending on the initial capacities, K_1, and the desired ratios among terminal capacities, g.

Through parametric changes in g, it is possible to trace out interesting sections of $E(K_1)$. The desirability of different efficient programs may then be compared by considering the associated consumption (or income) streams and terminal capital capacities.

The maximization problem is soluble by means of dynamic linear programming techniques.

The Data

Martin and Carter's interindustry analysis of the California economy in 1954 [9] provided the basic sectorial classification and flow data. We later developed primary resource and capital requirement coefficients [15]. Some revisions in the 1954 coefficients were performed after comparing actual levels during 1955–1964 with those implied by the 1954 coefficients.

Consumption functions were derived using the 1954 household consumption and income figures of Martin and Carter [9] and consumption elasticities given by Lee [6].

Rates of change in land and water coefficients were assumed equal and were estimated from yield figures reported by California Crop and Livestock Reporting Service [2, 3, 11].

Rates of change in the labor productivity of agricultural sectors are based on U. S. Department of Agriculture estimates of production per man-hour [12]. Changes in labor productivity in nonagricultural sectors are derived from income and employment figures, by industries, reported by the U. S. Office of Business Economics [13, 14].

The flow coefficients, a_{ij}, were adjusted down annually in order to produce an annual increase of 1 percent in the income coefficients, U. This rate was arrived at by comparing the actual rate of growth of California personal income to the rate of growth obtained by applying the 1954 income coefficients to observed output figures.

Unilateral capital transfer to California consists of property owned by immigrants. Net migration to the state was available from the state Documents Section [11], and per capita property ownership was calculated by capitalizing United States nonwage income [13] under the assumption that on the average the wealth position of immigrants to California conforms to that of the entire United States population.

Interest charges on the state's foreign debt were estimated at 6.3 percent from information available in Romans [10].

Gross technical coefficient, labor coefficient, and capital coefficient for the water-supplying industries were adopted from Hoch and Phillips [5].

Levels of exogenous exports during the planning period were estimated by applying equations (1′), (7), (8), and (10) to the observed levels of output.

Size of problem

The linear programming table for the planning period of seven years consisted of 577 restrictions and 603 activities.

Empirical Findings

The solution to the optimization problem is summarized in Table 1. Actual values for the base year 1954 are also given as bench-mark information.

The most striking finding is that, despite the high rate of economic growth (6.6-percent annual rate of growth in state income), the economically efficient water supply is practically stagnant. In fact, the existing capacity of the medium-cost water-supplying industry is not utilized at all, and at times (1957–1959) even the low-cost water-supply capacity is not fully exploited. Rather than invest in expanding the water-supply capacity, the efficient program proceeds by modifying the structure of output and trade in favor of sectors which, directly or indirectly, are less water-intensive. Thus, output of the "meat animals and products sector" undergoes a rapid decline, with a corresponding increase in imports. Consequently, the derived demand for "forage" also declines, thereby releasing water to meet rising demand by other sectors, such as vegetables, citrus, and other sectors of the economy, including household demand for water for residential uses.

It is worth noting that the growth rate of the primary agricultural and agricultural processing sectors was lower than that of other economic sectors. Indeed, this difference in growth rates would have been greater had labor migration from agriculture been faster. Scarcity of water seems to have little effect on the growth of the agricultural sectors.

Table 1. Efficient levels of state income, output, and trade, California, 1955–1961[a]

Sector	Base year 1954 (actual)	Program years 1955	1956	1957	1958	1959	1960	1961
	million dollars (1954 prices)							
State income	30,297	31,749	34,948	37,905	39,854	42,534	45,084	47,397
Primary agriculture								
Meat animals and products								
Output	337	355	58	[b]				
Trade	−248	−287	−732	−833	−867	−909	−949	−1,227
Poultry and eggs								
Output	312	339	377	398	417	439	462	489
Trade	2							
Farm dairy products								
Output	343	378	402	402	389	402	393	414
Trade			−56	−74	−86	−76	−149	−320
Food and feed grains								
Output	198	133	217	235	240	240	240	240
Trade	−25	−80	−18			−9	−18	−82
Cotton								
Output	284	216	286	302	317	376	378	335
Trade	228	188	226	240	226	314	315	264
Vegetables								
Output	488	537	616	690	773	816	816	816
Trade	141	157	220	290	392	438	439	438
Fruits and nuts (excluding citrus)								
Output	340	374	374	321	285	272	258	244
Trade	50	57	47					
Citrus								
Output	137	151	151	212	215	215	219	219
Trade	109	120	118	180	185	185	189	189
Forage								
Output	181	199	126	109	105	107	106	127
Trade	−2							
Miscellaneous agriculture								
Output	295	270	325	298	289	286	299	367
Trade	45	18	38	16	14	12		6
Total primary agriculture								
Output	2,915	2,951	2,931	2,968	3,031	3,154	3,172	3,253
Export	575	540	649	725	817	949	943	896
Import	−275	−367	−806	−908	−953	−994	−1,116	−1,630
Agricultural processing								
Output	4,949	5,444	6,261	6,457	6,379	6,478	6,707	6,793
Export	827	949	922	848	600	475	343	56
Import	−508	−397			−32	−69		−54
Other manufacturing								
Output	17,779	16,831	23,011	23,341	22,288	21,967	21,011	21,572
Export	4,704	4,525	4,979	5,297	4,556	4,455	3,883	3,617
Import	−6,738	−8,429	−4,459	−5,562	−6,851	−8,378	−10,512	−13,576
Other nongovernment (mining, utilities, services, trade, and construction)								
Output	31,715	33,854	33,847	37,454	41,031	45,094	49,901	52,636
Export	1,091	1,180	876	1,021	1,160	1,518	1,518	1,956
Import	109							
Noncompetitive import								
Import	−580	−816	−923	−947	−971	−1,010	−1,046	−1,095
Local, state, and federal government								
Output	9,443	9,906	10,961	11,778	12,325	13,107	13,863	14,656
Water utilization (1,000 acre-feet)	23,640	22,200	22,200	20,980	20,532	20,785	22,200	22,200

[a] Negative values of the variables signify import; positive values signify export.
[b] Blanks indicate zero.

Discussion and Evaluation

Several conceptual and practical difficulties arise in connection with the present approach. We have already alluded to the problem of developing an appropriate objective function. In the present study this difficulty was bypassed by resorting to the concept of efficiency. Closely associated with this is the problem of the planning horizon. The longer the planning period the more farsighted is the plan, but also the greater are the computational difficulties. However, if one is interested in planning solely as a basis for action, only the first few years (perhaps only the first year) of the plan count, since action in later years may be based on a revised plan. Now, under certain circumstances, an increase in the planning horizon beyond a certain point will not have appreciable effects on the first year's optimal values. In this case, there is no need for further extension of the planning period.[6] One is thus led to the concept of a "rolling plan" with a limited but receding horizon.

A cursory examination of Table 1 suggests further difficulties. In particular, the rapid decline in the "meat animals and products" and "forage" sectors and the level of exports originating in agricultural processing sectors appears to be unrealistic.[7] This "misbehavior" on the part of the model is due to its aggregative nature and insufficient recognition of many effective restraints. It may also be due to errors in the coefficients. These difficulties, of course, may be overcome, though not without additional cost of data-gathering and extended computations.

Finally, it should be emphasized that the present approach fails to take cognizance of many outputs of water resource systems, such as recreation and flood control. Furthermore, the geographic aspects of water resource development are also ignored.

It must, therefore, be concluded that, although not an adequate substitute for the conventional cost–benefit analysis, the general equilibrium approach presented in this paper may be quite useful in providing a general economic background to the partial but detailed analysis.

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[6] Experimentation with shorter planning periods not reported in this paper suggests that this is actually the case in the present analysis so that a seven-year planning period seems adequate.

[7] In actuality the "meat animals and products" sector was stagnant until 1959, growing faster thereafter. The "forage" sector was practically stagnant throughout the period, and exports of processed agricultural products slightly declined.

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The National Water Resource Assessment and Regional Framework Plans

HARRY A. STEELE

TWO years ago at the annual meeting of this association I closed a discussion of economic considerations in the formulations of policies for water and related land resources with the following statement:

> In summary, it is my view that considerable progress has been made and that the Water Resources Planning Act gives us a new organizational thrust, new approaches, and new opportunities to make even more progress toward the combined goals of economic development, quality of environment, and well-being of people.

This paper reviews progress over the past two years under the Water Resources Planning Act (PL 89-80) and outlines some of the problems encountered.

Water Resources Council

Title I of the act establishes the Water Resources Council, a cabinet-level group, which includes the secretaries of the departments with an interest in water and related land resources and the chairman of the Federal Power Commission. The Council members meet at least quarterly to consider major policy issues. The representatives of the members meet frequently to carry out the Council's policy directives and to perform the functions of the Council which are not reserved to the members. At the national level, the Council staff works with three administrative and four technical committees in performing the supporting staff work for the Council. Examples of the work performed by these committees are coordination of budgets, guidelines for planning studies, uniform technique for computing flood flow frequencies, review of proposed federal-state compacts, cost-sharing policy, flood-plain management, and review of comprehensive plans.

Federal-state river basin commissions have been organized for the Pacific Northwest, the Great Lakes, the Souris-Red-Rainy, and the New England regions. These commissions, operating under joint federal-state agreement as provided in Title II of the act, are preparing comprehensive plans for their regions. They also coordinate water and related land resources activities. Commission staffs are jointly supported by the Council and the member states. In addition, the Council has under its aegis 4 continuing federal-state river basin committees for major regions and 18 ad

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HARRY A. STEELE *is assistant director for planning, and research advisor, U.S. Water Resources Council.*

hoc committees coordinating 3 regional framework studies and 15 detailed studies of smaller river basins.

Under Title III of the act, the Council makes matching grants to designated state planning organizations to increase state participation in comprehensive planning. In fiscal year 1968, 49 states, the District of Columbia, and Puerto Rico took part in this program.

National Assessment

A major activity of the Council has been the first national assessment of the adequacy of the nation's water resources to meet requirements. The report of this first effort is in the process of publication [5]. The major water and related land problems of the nation have been identified through a series of national chapters on major uses or management functions and by 20 regional chapters prepared by field committees. Projections of population, economic activity, and land use were prepared for each region and used as a basis for projections for 1980, 2000, and 2020. Then projections of water requirements were compared with annual natural runoff to develop indices of water withdrawals and consumptive use for each region. Although the analysis is limited, this first national assessment provides the basis for several significant national policy recommendations by the Council.

The first national assessment highlights the changing nature of future water problems and the continuing need to reorient policies and programs as well as research activities. Estimates of water requirements have been based on projections of rapid change in technology. Recycling of water within industrial and steam-electric power plants is expected to increase substantially. Even with these increases in recycling, total water withdrawals were estimated to increase from 270 billion gallons per day in 1965 to 1,400 billion gallons per day by 2020. Agriculture, which was the largest withdrawal use in 1965, will be exceeded by both self-supplied industry and steam-electric power by 2020. Irrigation, which was the largest consumptive use in 1935, will continue to be the largest by 2020.

Although most regions will not face a shortage of water, greatly increased recycling and reuse of water will be accompanied by the need for new technology and expanded investment in water treatment and conditioning and in the control of industrial and agricultural wastes and thermal pollution. The assessment indicates some regions or portions of regions where consumptive use of water required for the projected economic growth would exceed available water resources. If these regions are to maintain the pattern of growth which they have experienced in recent years, water supplies will have to be augmented by some means. Many technological, economic, and policy problems arising from these situations will demand national attention.

Several steps have been taken to improve future national assessments. The Office of Water Resources Research is funding a research contract to develop an information and analytical system to support future assessments. A task force is examining federal activities for collecting and analyzing data on the use of water resources and will recommend major improvements in the system. A national map is in the process of preparation which will delineate major regions and some 200 water resource areas for use in future national assessments and related national programming activities. A work group of the Council is relating the national assessment to the Planning–Programming–Budgeting systems of member departments.

Regional Framework Plans

The Water Resources Council has a program to complete framework plans for the entire country in the early 1970's. Eleven of these studies are under way and nine remain to be started. These studies are carried out through river basin commissions where they have been established. In other regions the studies are made by various interagency committees. Framework plans will set out a strategy for future development and management of water and related land resources of a region [4]. They include (1) projections of economic growth, (2) translation of projections into requirements for water and related land resource uses, (3) projections of the availability of water resources, (4) projections of land resource availability, (5) identification of current and projected problems, (6) analysis of alternative solutions, and (7) recommendations of needed detailed planning, program authorizations, and other actions.

The Council's planning standards state that planning should be directed to three major purposes—economic development, enhancement of the quality of the environment, and well-being of the people [6]. The first purpose, economic development, is related to the region's share of national growth. The second purpose, enhancement of the quality of the environment, relates to intangible values not measured by the contribution of quality to the market value of uses of the resource. The third purpose, well-being of the people, relates to interpersonal and interregional income distributions which may depart from those implied in the national growth estimates.

As a guide to the first purpose, the Council has arranged with the Office of Business Economics (OBE) and the Economic Research Service (ERS) for projections of national growth of population and the economy to the target years 1980, 2000, and 2020. These economic projections present a consistent set of measures of the economy under assumed rates of growth. The OBE and ERS have then estimated regional shares in projected national growth. The regional shares are based on past performance of the regions plus any known developments that would change interregional relationships. Estimates are also made for subbasins within each region.

These projections are first approximations of how the national economic growth would be distributed, given the restraints on national economic efficiency that exist in the economy today. They do not, of course, take account of major policy or technological changes of the future.

From these projections, estimates are made of water and related land requirements over the next 50 years. A computation is made of the proportion of these requirements that can be supplied from existing facilities and programs in order to arrive at net requirements that must be met by new or accelerated programs.

In a similar fashion an inventory of water and related land resources will reveal the proportion of these resources that is committed to current uses and possible reallocation of existing uses in order to arrive at an estimate of net resources that may be available for future development to meet net requirements. Tests of various combinations of programs will indicate the least-cost means of meeting net requirements.

There are many problems in preparing such a plan, but our approaches appear adequate for the rough approximations required in the framework studies to estimate the investment schedules and programs needed to meet future water requirements and to outline the legislative and policy steps that should be taken to solve other problems.

What happens if the supply of resources is not adequate to meet future growth or when there is a surplus supply of resources in relation to expected growth? This may mean that our approximation of the region's share of national growth has been off the mark. There needs to be a continuous re-analysis of national and regional projections as the regional framework studies progress and more detailed information becomes available.

Perhaps economic growth in the past has not been affected by the availability of water and related land resources. Our preliminary estimates in the national assessment indicate several regions where projected consumptive use requirements will exceed available water resources. If the region's water resources are not augmented, the pattern of economic growth will be modified and total growth may be reduced. This restraint is not included in the first approximation of regional shares.

In the region with more adequate resources, the question arises as to whether resource development can induce a greater share of the national growth to occur in that region. Several regions have abundant water and land resources in relation to current or projected growth. Framework studies in these regions should explore whether resource development can induce a faster rate of growth and provide tests of the desirability of such developments. For example, the resources of an undeveloped river might be used for hydroelectric power and irrigation to draw settlers and industry to the area. The water development might result in the region's attracting more than its projected share of national growth, with resulting stimulation to related business activity in the region but with possible adverse effects on other parts of the nation. An alternative might be to preserve the scenic and wilderness values by leaving the river undeveloped.

This leads us to the second purpose of water planning—enhancement of the quality of the environment. In addition to preservation, this involves improving the quality of our environment. Many of the values involved in this purpose are not measured in the market. We have not found satisfactory ways of entering them into benefit–cost analysis. Our planning standards suggest that we use the opportunity cost of departing from the national efficiency model to preserve or enhance the environment. This provides a cost measure of the alternative when the objectives are in conflict in a particular area but does not give a satisfactory guide to the development of a national or regional plan for the enhancement of the quality of the environment. As a result, the scope of programs for enhancing the quality of the environment can only be arrived at through policy decisions as to national need.

Another situation is the region with a large segment of its population with depressed incomes. Can water resource development be used to increase employment opportunities and to alter the interpersonal distribution of income? The attention given to water resources projects in designated economic development areas and now being considered more generally indicates a widespread belief that interpersonal income distribution can be affected through investment in such projects. We need much better methods of analyzing these effects.

The problem in the regional framework studies is to bring environmental quality and well-being objectives into the analysis and to measure the departures from the national projections required to achieve such objectives.

In the Pacific Southwest framework studies, for example, four levels of water availability are being analyzed to determine the economic activity associated with each level. One of the levels is the water requirements for the economic activities indicated in the national projections. This analysis of alternative water supply situations will provide a measure of the benefits from possible augmentation of water supplies. In areas where water resources are declining and will not support either current or projected economic activity, the analysis will provide a measure of the economic losses to be expected. The results of the analysis of four levels can be related back to the national projections.

We can approximate the trade-offs between regional development and national income in terms of opportunity cost of national income foregone.

We can express the trade-off for enhancement of the environment in terms of either regional development or national income. However, the nation's goals and needs for improving the environment or redistributing incomes remain issues that must be settled through the political process. We must find ways for comprehensive planning to be of more assistance in this process.

In addition to the alternatives in objectives, the framework study must also consider alternatives in program means of achieving objectives. In the case of structural elements of the program, after formulation for maximum net benefits, a test is provided to make sure that there is no more economical means of accomplishing the same purposes.

Nonstructural Alternatives

When nonstructural measures are considered as alternatives or in combination with structural measures, it becomes very difficult to make meaningful economic comparisons. There have been many policy pronouncements about the desirability of giving nonstructural measures full consideration in planning, but more must be done before real progress can be made. Part of the problem is the different incidence of benefits and costs from different alternatives and the subtle influence which this has on the planning process. There is also a problem of federal–state–local jurisdiction. Even though the nonstructural alternative may be the most economical alternative, the necessary legal and institutional arrangements may not be available to carry it out. The institutional arrangements for planning, authorizing, and building structures are much better established.

The Council is attempting to broaden the approach to solution of water problems. For example, an effort is being made to combine flood protection works, flood hazard information, flood plain regulation, and flood insurance into a unified program of flood plain management. Several states have passed or are considering enabling legislation for flood plain zoning. Authority for flood insurance is provided in the housing act which is nearing enactment by Congress [2]. The Council is studying consistent cost-sharing policies for the various means of flood plain management.

Long-Range Schedules of Priorities

Under the Water Resources Planning Act, river basin commissions, in addition to their other functions, are to recommend long-range schedules of priorities for the collection and analysis of basic data and for investigations, planning, and construction of projects. This is an extremely important function and relates closely to the programming, planning, budgeting systems being developed in the federal government and similar systems in state governments. The function relates to the timing and interdependence of various steps in the process of data collection, investigation, planning, and construction. The lead time between data collection, planning and construction may be many years. Construction must be timed to the growth of requirements. Timing affects the actual benefits and costs of a project and may have significant impacts on financial feasibility. The Council and river basin commissions are in the process of establishing procedures to carry out this function.

Impact of Urban Growth

Our national water requirements and water problems are shifting and changing as the nation becomes more and more urbanized. About 72 percent of our population is now concentrated in urban areas. If current trends continue, almost all of the projected population increase of the next 50 years would occur in expanding urbanized areas making up huge strip cities.

Urban areas are now the focal point for a growing share of water programs. As a result, the federal investments in water development for waste treatment, water supply, and recreation are growing more rapidly than the traditional purposes of navigation, irrigation, and flood control. Developments must be designed to meet more adequately these rapidly growing requirements.

There is a large body of opinion which holds that concentration of our economy in the relatively small space of urbanized areas is not desirable. Many seek a more even geographic distribution of people and income and believe that federal investment in the development of water and related land resources, together with guidance of the location of other types of federal investment, can achieve such goals. The national assessment and the regional framework studies will provide the means of analyzing the consequences of such major national policy alternatives.

Urban growth is also having an impact on organizational arrangements for water planning and management. Economies of scale provide the incentive for large metropolitan regional organizations to provide water supply services and to collect and treat waste water and sewage. As these organizations grow, they and their customers will seek a larger decision role in water resources planning. Institutional arrangements patterned to federal–state relations will need to be adapted to the federal–regional–state–urban complex of relations.

Planning Policies and Standards

The Council has under consideration a revision in the formula for determining the interest rate to be used in planning water and related land resources. The proposed procedure is related to the yield of long-term government bonds rather than to the coupon rate as now provided in our planning standards [6]. Several related problems are raised by this proposal. The Senate Interior Committee, for example, has pointed out that there are many related aspects of plan formulation and evaluation that must be reconsidered [1]. The Council has had review of its planning policies and standards on its agenda and, as necessary staff work can be accomplished, will undertake a general restatement. In contrast to earlier works on benefit-cost analyses, this effort will be of widespread public interest. Many groups have expressed an interest in being consulted during the review.

National Water Commission

Enactment of legislation establishing a National Water Commission [3] is an indication of the intense public interest in the nation's water problems. This commission, consisting of people from outside the federal government, is directed to review the nation's water policies, including the problem of interbasin interstate transfers of water. The legislation provides for cooperation between the Water Resources Council and the Commission. The Council may request the Commission to consider major issues. The Council is to review and comment on the Commission's reports. Close cooperation would be expected between the staffs of the two organizations. The Council's national assessment and comprehensive framework studies should be of considerable value to the Commission.

Summary

While the past two years have demonstrated the strong points of the Water Resources Planning Act and also some of its weaknesses, the next few years will provide a much more severe test. The Council will be revising its planning policies and developing and improving its regional and national planning procedures. Many national policy issues will be considered by the National Water Commission. There would appear to be great opportunity for constributions from the economics community to these difficult tasks.

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Economics in Regional Water Research and Policy[*]

EMERY N. CASTLE AND RUSSELL C. YOUMANS

PART I of this paper pertains to water resources and regional economic growth. Part II deals with choice indicators in public decision-making with respect to investment in natural resource investment.

Water Resources and Regional Economic Growth

Recent federal action and statements

The federal government has long been active in the area of water resource development. Several agencies are deeply involved in this work: the Corps of Army Engineers, the Bureau of Reclamation, the Soil Conservation Service, and the Federal Water Pollution Control Administration provide examples. In this decade, Congress has established the framework for new directions in water development throughout the nation. The passage of the Water Resources Planning Act (Public Law 89-80) and the establishment of the cabinet-level Water Resources Council has made specific the desire for coordinated and comprehensive water planning.

Subsequent to the establishment of the Water Resources Council, twenty major hydrologic regions of the nation have been identified for purposes of comprehensive planning. Eleven of the regions are currently developing their comprehensive water resource development plans.

The role of the economist is a demanding one in this multidisciplinary comprehensive planning effort [10]. We are viewed by administration of these programs as capable of generating ex ante the economic potentials for alternative resource development projects. This would include the summation of economic benefits for inclusion of the benefit-cost analysis outlined in Senate Document 97 [18]. Finally, we are to provide economic projections, both national and regional, to indicated future needs for resource development. This, of course, assumes that we know the relationship between levels of resource development and economic growth or vice versa. Further assumed is that the relationship is positive and highly significant.

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EMERY N. CASTLE *is head of the Department of Agricultural Economics and* RUSSELL C. YOUMANS *is assistant professor of agricultural economics, both at Oregon State University.*

Assuming that we know the above relationships and can provide the total of social benefits from a resource development project for inclusion in the benefit-cost ratio, planning is not then complete. Planning for social development is more than the preparation of alternative levels of resource development to provide for projected "needs." The "economic projections" have placed major limits on the nature of future society. The "needs" seem to imply a fatalistic acceptance of extensions of present trends as indications of the future. The regional objectives may not include expanding population and the associated expanding employment or increasing regional gross product, but rather maintenance of per capita income or other social objectives. Stable or declining populations are present currently in some areas of the nation. Can we deliver a satisfactory "plan"for these areas?

Research results on water availability and economic growth

The main thesis of this section is that little information is available relating water availability and economic growth. In 1964, Congress passed the Water Resources Research Act (Public Law 88-379), which established research centers in each state. With only four years of operation, it is too early to evaluate the success of this program. Considering all forms of federal research support in the water resource field, relatively little work has developed from economics and the social sciences. Recently encouragement has been given to social scientists to contribute in this area, but at present we have relatively little work relating natural resource availability and economic growth, and naturally, less if water is the principal resource in question.

Gilbert White begins to put dependence upon natural resources in focus: "In examining the structure of the American economy historically with projections of the nature and direction of future growth, it seems clear that although the role of resources in the national economy is an important one, its significance is diminishing with time" [19, p. 14]. Barnett and Morse [1] review the relationships between resource availability and economic growth; however, water was not included because of lack of data. They do comment that water has been virtually a free good and has been used with the expected lavishness. Further, with nominal charges, water use patterns could be altered significantly. With respect to general natural resource dependence in the American economy, they complement White: "Substitutions, . . . and perhaps the realization of economies of scale in the social production process as a whole, . . . all weaken the effect of increasing [natural resource] scarcity" [1, p. 7].

Blair Bower [4] came closer to the relationship of concern. He looked at industries' location decisions with respect to water availability. He found that, generally, water availability is a micro location factor for industry or economic growth and not a macro location factor; that is, water affects the decisions of location or impact of growth within a region but not between regions. These conclusions were generally supported by the works of Ben-David [3] and Howe [13].

Charles Howe's contribution in this area is recent; the following quotation comes from his conclusions:

> It is naïve to presume that the complex phenomena of regional growth can be explained by physical measures of the conditions of availability of one factor of production (water). The evidence . . . demonstrates that water did not constitute a bottleneck to rapid economic growth in water deficit areas . . . nor did its presence in large quantities in other regions guarantee the rapid growth of these regions [13, p. 488].

Howe recognizes the importance of water historically as an agricultural and industrial input and as a mode of transportation. These combined effects were highly significant in determining the pattern of economic growth. But in his research he did not find this relationship being maintained between water-abundant and water-short regions of the nation during the 1950–1960 decade.

The above research is pioneering but raises questions about the direction of some of our water development planning. Our past dependence upon natural resources has been significantly altered and could be altered further through changes in some institutions and resource pricing policies. Some of the problems of natural resource development do not lend themselves to the traditional tools of analytical economics, and this has reduced the expected contribution of economists.

Traditional economics has limitations with respect to problems of economic growth and to many of the water development projects considered. First, a general theory of economic growth does not exist and is not likely to be developed. Rather, we have many theories developed for specific situations, so the growth process is left for nearly individual appraisal. Second, the magnitude of many water projects exceeds or stretches the ability of marginal analysis, which has been the major analytical tool on many of our firm and policy problems. The units of change are large and potentially would alter the economic relationships upon which marginal analysis is based [6].

Some growth hypotheses

If we are correct in our analysis of (1) current activity in water resources planning by government agencies and (2) the present state of affairs with respect to knowledge about public investment for water development and economic growth, there may be significant payoff to additional research on this subject.

Procedures which emerge from present planning efforts and which relate economic growth to water in a gross fashion may provide far greater apparent economic rationale for public investment than a static benefit–cost ratio. Economists outside the planning efforts will probably have little impact with criticism of such efforts unless they can demonstrate in a convincing fashion that the underlying assumptions are invalid. They are not likely to be able to demonstrate this unless they give systematic attention to the subject of public investment in natural resources and regional economic growth.

To illustrate the kinds of issues that will be raised by such studies, we take as given a particular development theory. We deduce from this some hypotheses pertaining to the relation of public investment in natural resources and regional growth. We then speculate concerning the type of investigation likely to be most useful in decision processes. The development theory we have taken as given is that of Hirschman [12].

We state the essentials of the Hirschman theory:

1. The principal cause of lack of progress in development is not a shortage of a particular limiting factor, except for the factor or factors that result in a deficiency in the combining process itself. The fundamental problem consists in generating and energizing human action in a certain direction.
2. "In advanced economies, savings and investment decisions are independent of one another to a substantial extent, and per capita income is one important determinant of the supply of savings. In an underdeveloped economy, on the other hand, investment and savings decisions are largely interdependent" [12, p. 32].
3. Investment has two parts, induced and autonomous. Induced investment stems from past demand or profits, and autonomous investment stems from new opportunities.
4. Development is held back mainly by the difficulty of moving existing or potential savings into production investment opportunities. The assumption is made that existing and potential savings often exceed total investing capacity. Evidence that this is the case can be found in hoarded gold or foreign exchange, luxury consumption of the rich, and occasional large-scale spending and gifts among the poor, and by considerable time devoted to leisure [12, p. 37].
5. Total investing capacity or ability to invest becomes a function of opportunity, ability to perceive opportunity, and ability to do something about it.
6. The sequence of investment, both private and social, potentially affects the returns, such that in viewing the long run, an investment with a lower present return might be selected if it leads to significantly higher returns in an associated investment in the future.

If the Hirschman argument has validity, it has considerable implication to public investment in social overhead capital. Chapter 5 in Hirschman's book treats this subject. He argues that investment in social overhead capital is important, not primarily because of its direct effect on final output, but rather because of its impact on directly productive activities or private saving and investment. It is interesting to speculate about the above with respect to benefit–cost analysis. Assume a situation with the following variables to be of relevance:

B is the increase in income for the geographic area selected for analysis.

C_p is all public costs associated with the project.

C_a is associated costs. These are costs over and above project costs needed to make the goods and services of the project available to the economy.

In traditional benefit–cost analysis, the benefit–cost ratio, R, is calculated by

$$R_1 = \frac{B - C_a}{C_p}. \tag{1}$$

The above will permit projects to be compared on the relative efficiency of government funds in making contribution to regional or national income, as the case may be.[1] If one were concerned about efficiency of total resource use, equation (1) could be modified:

$$R_2 = \frac{B}{C_p + C_a}. \tag{2}$$

If the Hirschman analysis has validity, both the absolute size of C_a (the amount of autonomous investment stimulated by the project) and the relationship of C_p to C_a become important. One might wish to devise measures that would permit the judgment of relative merits of projects on the basis of their effectiveness in mobilizing private investment. Sensitivity to changing conditions would be very important, however, because at some point it is possible that capacity to organize capital could exceed the availability of capital. If this were to happen, the use of benefit–cost ratios which assume capital to be the limiting factor would be useful. If capital is not limiting, benefit–cost ratios which assume that it is may have limited value.

The above has implication to public investment in water resource development as related regional economic growth. An economy in a relatively undeveloped state will tend to have low accumulated capital, with a small group of individuals experienced in perceiving and exploiting investment opportunities relative to a more advanced economy. Investment in social overhead capital will have the greatest impact if it makes use of easily available resources and if it results in autonomous investment which stems from relatively traditional kinds of economic activities.[2] On this basis the hypothesis can be advanced that investment in water resources development will play a significantly different role in economic development, depending upon the stage of development of the region or nation in question.

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[1] When projects are compared on the basis of the ratio resulting from the application of equation (1) it is usually implicitly assumed that the scale of projects has been determined on the basis of some incremental rule. In other words, it is not normally assumed that projects would be planned so that the benefit–cost ratio itself would be maximized for a particular project.

Traditional benefit–cost analysis normally has little to say about the sequence of investment. Rather, either social overhead or private investment can affect the return on the other; the same is true for a series of either social or private investments. The investment sequence may alter the returns by varying magnitudes, resulting in different benefit–cost ratios (R). In the context of regional growth, the responsiveness of the private or social sectors may be a factor in selecting a sequence of investment, with the alternative returns for different sequences offering different strategies for stimulating economic growth.

Irrigation may be a relatively good public investment over a considerable range of development. Farmers can make use of water without completely changing from traditional patterns of production. Irrigation frequently is quite demanding of labor, relative to capital. It results in increased output by a reduction of leisure, relative to withdrawals from an income stream. It results in output from a primary industry with increased associated costs and possibly autonomous investment, in "induced" and "stemming from" activity [11]. In contrast, it is not at all clear that public investment in water development will be as effective in more developed economies.

Although the above is advanced with some confidence that the hypothesis suggested is worthy of test, we are not nearly as confident regarding what would constitute an appropriate test. It would be easy enough to examine projects for which traditional benefit–cost analysis had been made, and to recalculate and observe the effect on project rank by use of equation (2) and the relationship of C_p to C_a. This, of course, would not test the hypothesis. Testing could be done, perhaps, by comparing projects on a "before" and "after" basis by the use of regional input–output analysis. One could ascertain on the basis of such analysis the direct and indirect output effects resulting from alternative types of public investment.

Choice Indicators and Regional Economics

There has been considerable preoccupation in the profession with the issue of choice indicators in project selection. The most recent additions to this literature are the writings of Maass [16] and Kelso [14]. The matter is of particular interest in regional resource development because of government policies, of which Appalachia is a good example, which have as their objective the stimulation of regional economic growth. Senate Document 97 provides for regional benefits to be included in project evaluation: "Secondary benefits attributable to the project from a regional, state, or local viewpoint. Such benefits shall also be evaluated, when this procedure is considered pertinent, and an additional benefit-cost ratio computed" [18, p. 6]. There appear to be at least two issues involved: (1) the adoption of a geographic point of view, and (2) adoption of an appropriate choice indicator.

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[2] Stimulates and/or enlarges the above "small" group.

The geographic point of view

Economists have a strong tendency to adopt a national point of view in their analysis. One can speculate concerning the reasons. Our theories are usually developed from such a vantage point; the viewpoint of Adam Smith has largely been followed to the present time. This is appropriate, of course, if economics is being used as a policy tool for the central government of a nation. However, many economists have developed a strong normative attachment to such a point of view and apparently suffer a guilt complex when a less aggregate outlook is adopted. Yet this is essentially an arbitrary decision; a global point of view could be justified on the basis of certain value judgments. We believe that the selection of a geographic base for economic analysis is arbitrary from the standpoint of economic principles. A strong case can be made for keeping regional and national analysis separate, at least to a point, so that national and regional consequences do not become confused [9].

Appropriate choice indicators

In an often quoted article, Maass argues that the major limitation of benefit-cost analysis is that it ranks projects and programs only in terms of economic efficiency [16]. He then says, "But the objective of most public programs is not simply, not even principally, economic efficiency. The redistribution of income to classes or to regions is an important objective in government plans—witness the Appalachia program. And there are other objectives too—the promotion of national self-sufficiency, for example" [16, p. 312]. He goes on to argue for analysis that will permit trade-offs to be determined. He settles for economic efficiency and income distribution as being the two objectives for which one should calculate trade-offs.

Kelso argues that economic efficiency, as commonly measured, is an aggregate of subsets of diverse states [14]. Three subsets mentioned are level of aggregation, time dynamic, and efficiency goals expressed in other than real income terms.

We have considerable sympathy with the Kelso point of view. Elsewhere in the paper we discuss the relationship of public investment to regional growth. The problems surrounding the measurements of extra-market benefits constitute one of the significant research areas for resource economists [7]. Given the possible inconsistency of economic efficiency measures at different levels of aggregation, it may be wise to keep the analysis specific with respect to level of aggregation. All of Kelso's subsets are relevant only if externalities exist, whereas he implies that externalities are relevant only with his third subset.

We are troubled, however, by the position of Maass, adopted by Kelso, that economic efficiency should be considered as a trade-off with other social goals such as income distribution. It is with this issue that we would like to wrestle in the following paragraphs. Kelso puts the matter in perspective when he says, "Thinking of the peak criterion in water resource development decision making as a complex aggregate of non-homogeneous sub-sets puts it conceptually within the principle of the product-product relation in production economics theory" [14, pp. 7–8]. We believe that this misses an essential point with respect to economic efficiency relative to other social goals.

In order to accept the above point of view, one would need to imagine a hierarchy of social goals and values, with economic efficiency on the same level as the other goals and values being measured [5]. We doubt that this is the case. We would hypothesize that economic efficiency is a less ultimate goal than is an appropriate distribution of income. As a consequence, economic efficiency becomes a means to other ends rather than competitive to those ends. The extent to which improved economic efficiency, as commonly measured, permits other goals to be achieved may vary with the stage of economic development of a geographic area, whether it is a nation or a region within a nation.

Extensive speculation by two agricultural economists about the ultimate goals of any society is not likely to be especially fruitful. However, if we imagine certain ultimate goals, such as individual dignity and fulfillment, the brotherhood of man, and a classless society, it is doubtful that anyone would ever suggest economic efficiency as being at that same level. W. Arthur Lewis places economic growth in this perspective when he says, "The advantage of economic growth is not that wealth increases happiness, but that it increases the range of human choice" [15]. Economic growth appears here clearly in a supporting role to higher objectives of man. It is not likely, however, that such ultimate goals can be achieved when the production of economic wealth in a society is at a low level. As the production of economic wealth increases, the extent to which improved efficiency, if measured by an increase in national income, can be used to achieve these more ultimate goals may decline. In Figure 1 we present a simple functional relationship to illustrate our hypothesis. Here, improved national income is viewed as an input and individual fulfillment

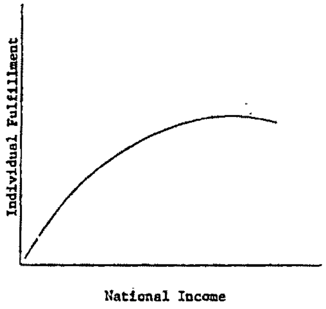

Figure 1.

is considered to be the product. The familiar relationship is hypothesized to illustrate that over a range improved national income may be a necessary but is not a sufficient condition to improved individual fulfillment. But the key to the matter, we believe, is that improved national income is used as an index of improved economic efficiency. As national income improves, the importance of extra-market goods, which are not normally included in improved national income, increases. It is not that economic efficiency loses importance; it is simply that the traditional ways of measuring it do not bring into the open the items of greatest relevance. It is still a means to an end, but the ends have tended to shift away from those items that can be included as part of national income toward those that cannot be, or at least are not being, included. Whether these extra-market goods can be brought within the measurement of national income is another matter which is outside the scope of this paper.

If the above is correct, then the calculation of trade-offs between economic efficiency and greater equality of income distribution may make little sense unless they are at the same hierarchy level as social goals. Only if this is the case is the product–product analogy valid. We now comment somewhat more extensively on income redistribution as an objective of social policy.

The market will result in an optimum allocation of resources only if certain conditions are pesent. In the case of income distribution, however, there is no *a priori* assurance that an optimum distribution will result, even when these conditions are present [2]. It has probably been dissatisfaction with the distribution of income or the desire to achieve some other objective that has frequently led to a modification of market operation, rather than a desire to improve economic efficiency. In view of this, it may seem surprising that income distribution is not attacked directly by taxes and subsidies rather than by public investment or other special problems that have a definite resource allocation effect. However, there may be at least two reasons for this:

1. We may have been more interested historically in provision of op-

portunity than in income equality in a static sense. This may have particular relevance to such programs as that of the Bureau of Reclamation, where one of the objectives was the provision of opportunity in agriculture.

2. Income distribution and "effort" have been closely linked in our value system. It is only recently that we have been able to accept the idea that income may be a function of the social environment as well as individual effort. In this context, poverty becomes a social as well as an individual problem [8].

It is not at all clear to us how one would proceed to calculate trade-offs between economic efficiency and income distribution. This becomes especially complicated as one views the problem within the context of regionality. For example, how does one compare public investment in resource development in Appalachia with a water transfer scheme to the Southwest? Both undoubtedly have income redistribution objectives, but surely these objectives are very different when one considers the per capita income of the two regions.

Society undoubtedly has many and varied objectives when national programs are undertaken in education, highways, and natural resource investment. The economist can never be sure just what these objectives are. Presumably they are sometimes stated by decision-makers. Yet surface statements need to be taken with a grain of salt. In order to ascertain objectives with precision, one would have to examine motivation of the participants in the decision process. Even then one would be faced with the problem of either assigning relative weights to the preferences of the participants or taking the result of the political process as given. Much progress has been made in recent years in stating public objectives. No doubt PPBS has had considerable influence on this, and will probably have more, but the fact remains that these objectives are a result of the political process. There is no assurance the reflected goals and objectives are at the same level in the hierarchy as is economic efficiency. In a PPBS context, the specification of objectives may be quite valuable, since alternative means of achieving these objectives can be compared. For example, if the objectives of a water transfer plan to import water in the Southwest could be specified, alternative ways of meeting these objectives could be developed and investigated. If continued economic growth of the Southwest is an objective, other public action might be more effective, given the present state of economic growth of the Southwest.

If economic efficiency is viewed as an input or a means to the accomplishment of more ultimate ends, where does that leave benefit-cost analysis? We argue that this leaves benefit-cost right where Congress thought it should be in the beginning. The Flood Control Act of 1936 states, "The benefits to whomsoever they may accrue should exceed the costs" [17]. Stated in this way, a benefit–cost ratio in excess of unity becomes a necessary condition for project construction. The statement does not imply (1) that projects should be ranked on this basis or (2) that economic efficiency, as measured by changes in national income, is the only objective of public investment and that it should be maximized. Rather, it is simply recognition that the achievement of objectives not included in national income may come at a cost, and there is a maximum cost which can be paid. The benfit–cost ratio is then relegated to the statement of a necessary condition.

We do not find this distressing. This procedure clearly places reliance on the institutional and political system, even though it does not suggest that the existing system is perfect. It does suggest that economic science has not yet progressed to the place where it can serve as a substitute for sequential decision-making as this is reflected in our institutional framework. Economic evaluation will be most helpful as it (1) predicts probable consequences of particular actions within an institutional framework, and (2) analyzes the impact of different institutional arrangements on individual and group action.

Until economics can solve the problem of specifying a social welfare function, the calculation of "trade-offs" as visualized by Maass will not be a fruitful undertaking. Such a procedure is likely to be little more than a fishing expedition. Better, we believe, to frankly recognize that our institutional framework has been developed to render judgments on just such matters than to ascribe to economics a function higher than it is capable of performing.

Such a position does not necessarily result in a reduction in the value of economic analysis but rather gives it a more indirect but potentially more powerful role. Of course there is more to economic analysis than the estimation of economic efficiency effects. But we are not among those who sneer at efforts to estimate economic efficiency effects. Economic efficiency is important as a means to the accomplishment of more ultimate ends.

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Discussion: Water Resource Economics

DAVID J. ALLEE

My charge from the organizers of this session—as the only reviewer for three papers—was to put these papers into some sort of perspective. Where do they fit with respect to the sweep of academic interest in water resources policy and development?

For this I need to suggest some kind of framework. One is suggested

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DAVID J. ALLEE *is associate professor of resource economics and acting director of the Water Resources Center at Cornell University.*

by the papers themselves—their concern with comprehensiveness and rational decision-making and the agony that the authors have gone through as they identified point after point where they must compromise with this ideal. Self-esteem is preserved only because they can see where others have compromised even further and so they are still on the side of the angels. It is man's curse that he can conceive far better than he can achieve.[1]

Zusman and Hoch point with justifiable pride that they offer an analysis based upon a concept of general equilibrium to complement the partial-equilibrium approach of benefit-cost analysis. But in what sense is this a full equilibrium or comprehensive? Driven by the limits of their data, their model, and their computer, they must omit many traditional water functions and of course they cannot include values which are not monetized in the economy. The uncertainties which this raises are manifest. They discussed too few of these uncertainties, and as a result their conclusions remain unconvincing. But one more tool in the comprehensive-rationalist tradition is elaborated a bit more for our consideration. And, more significant, it is a tool oriented to the behavior of a regional economy, a point of view most significant in decision-making but too often misused because it has not been illuminated by our analysis.

Now the world is not, apparently, organized to make easily decisions based upon the traditional economist's view of life. What we assume for a framework while striving to be rational and comprehensive is almost always normative in content and is value-loaded.[2] Castle and Youmans in their two-phase effort try to grapple with this a bit more directly. They too move from the view that regional interests are to be dealt with overtly and require special analysis. I am grateful that in reviewing what little literature there is on this subject they conclude, as I have elsewhere [1], that in more-developed regions excess capacity in water services probably does little or nothing to increase the rate of development. If this is true, why do agencies work so hard to achieve this excess? Can we criticize successfully until we explain it?

Further, they point out that changing the income opportunities of particular groups is most relevant to decision-makers and again should be made explicit in our work. In arguing some of the niceties of efficiency vis-à-vis income redistribution, it would seem that they are back in our central tradition, working with these concepts in terms with which we are most familiar, and thus they may be obscuring as much as they illuminate. Efficiency implies one distribution of gains and losses, and a variation from whatever it is that we call efficient implies another distribution. Whatever the hierarchy of goals, we should know these distributions.

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[1] I must confess that contrasting the "synoptic conception of problem solving" with the realities of "disjointed incrementalism" is a framework which I borrowed from Braybrooke and Lindblom [2].

[2] The limited understanding of some of our major presuppositions was once illustrated by Harold Barnett when he suggested in a lecture that we observe how often members of other professions place a higher value on benefits realized in the future than on those realized currently and are not willing to count benefits as of equal value regardless of the status of the recipient.

The point I am driven to make is that we spend a great deal of time working within our comprehensive-rationalist framework and lose sight of the attendant task of fitting it to some conception of how the world of agencies and men really behaves. It is one thing to say that we have a concept against which behavior should be tested. It is perhaps an even more rewarding task to suggest how in fact this goal can be achieved. One such step is the long-sought-for creation of agencies which in fact can take a more comprehensive and rational view of the world. Steele reports to us from such a vantage point.

This is not to suggest that members of the Water Resources Council are not also forced to compromise with our ideal—indeed they must. But at least it is their role to share it. They suffer only slightly less than the agencies which make up the Council from the imperatives of fragmentation and incrementalism. My point is that I doubt whether you can have as fully constructive an effect on his agency or any of the many others in the water game unless you can supplement our traditional comprehensive-rationalist view with some operational rather than normative concept of a fragmented–incrementalist world.

The Water Resources Council, the basin planning commissions which the Council helps to create, the interstate compacts that in some cases will effectively substitute for such commissions, and to a lesser extent the state planning groups and the Corps-of-Engineers-led basin coordinating committees, all can with more rigor and rationality cause the action agencies to move beyond their traditional roles and authorizations. They can have the technical capacity to limit, integrate, and stimululate the work of others (for example, to internalize the externalities) at the key point where projects enter the inventory from which choice must be made. They may even have the political power to forge the coalitions necessary to implement the plan, as well as to modify it along more rational lines.

I suspect that Steele has identified the kinds of economic studies which his informed judgment suggests would be most helpful to the groups that can be comprehensive in achieving better policies. The National Assessment is less an attempt to identify an efficient optimum and more a tool to be used in incrementally tightening the rules of the game to achieve something closer to an optimum. He, like Castle and Youmans, suggests that identifying the consequences of particular actions would be helpful. For example, what are the implications of projections that indicate water shortages or water abundance? Both the other papers suggest that for a highly developed region there may be little implied, but the evidence is hardly conclusive nor in a form very helpful to Mr. Steele.

Opportunity cost is a concept which Steele stresses and which neither of the other papers seem to have developed. Zusman and Hoch would have added much more to the finding, widely accepted by economists, that shifts in industrial mix can (and should?) substitute for water development *if* they had more clearly estimated the opportunity costs involved. Indeed, their framework was not suited to that task. It would involve estimating both the transfer costs and the decision-making costs (a mixture of bribes and opportunities foregone to use political power to other ends).

Castle and Youmans confuse me somewhat in their treatment of Maass's discussion of trade-offs between income redistribution and efficiency. If two plans are proposed to achieve pollution control and one involves admittedly higher total tax costs (tertiary treatment) but preserves visual as well as water quality amenities (avoids dams), it might be called the less efficient system. But since the new benefit is not quantified (indeed, neither was the old) and now certainly a different level and mix of benefits and costs is involved, a choice affecting income redistribution has been operationally defined. The trade-offs seem identifiable if not measurable. I don't think that this is what they mean to assign to a fishing trip (a worthy thought here in Montana) until we solve the problem of specifying a social welfare function. I too doubt whether we will ever prove that we have found the ratio at which marginal social products are equal for an increase in product cost traded, or at least endured, in return for so much more income for group A and so much less for group B. But working out the estimates for situations in the class of events which my example above characterizes is a function which economics can perform. Does Maass really feel otherwise?

In any case, it would seem that such estimates are the kinds of opportunity-cost analysis for which Steele is calling. Carry his concerns a bit farther and I think we can see that much of what he needs is better handles by which to grab the external effects of particular development decisions. If quality of the environment cannot be fully reflected in the control measures at the Council's disposal—benefit–cost analysis and opportunity-cost estimates—and thus must be decided on a fully political basis ("through policy decisions as to national need"), this is still an internalization process.

Externalities, indivisibilities, and market failure—failure whether in real or synthetic markets—are still the elements of the game we can play [3]. As Castle and Youmans almost say, let's get on with the game.

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ECONOMICS IN PUBLIC LAND POLICY

CHAIRMAN: RUSSELL DUANE LLOYD,
FOREST SERVICE, USDA

Public Land Policy in the Context of Planning–Programming–Budgeting Systems

MAURICE M. KELSO

The Context—PPBS

PPBS is the nearly universal code symbol for the Planning-Programming-Budgeting System of the federal government. It was ordered adopted by President Johnson in August of 1965 as the official federal system for program planning and budgeting. The Bureau of the Budget in October of that year ordered that it be applied in all respects by 22 departments, agencies, and administrations, which include all those that play any significant role in public land management. The bureau requested, but did not order, that it be applied by another 17 boards, commissions, and agencies.

It was first applied by the 22 departments and agencies in the preparation of their budget requests for FY 1968, a process which began early in the calendar year 1966. Thus, it is evident that official and wide use of the system is recent in the government generally and in the public land managing agencies specifically and that experience with it by agency heads and their staffs is limited. It is not, however, a totally new system within the federal establishment. The initials PPBS first gained notoriety in 1961 when Secretary McNamara launched the system in the Department of Defense, where it was intensively developed and widely applied in defense planning and budgeting in the intervening years. William A. Carlson, deputy director of the United States Department of Agriculture's Planning, Evaluation, and Programming Staff, says that PPBS

> was not as radical an innovation for civilian agencies as it might have seemed. . . . Program budgeting, and long-range program planning, were familiar management tools in USDA in 1965 . . . and in some of the constituent agencies of the Department–notably the Forest Service. . . . But the advent of PPBS did signal a new stage in the development of program planning and program budgeting in USDA. . . . Major changes have occurred in four areas:
>
> 1. The development of a comprehensive program planning framework, covering all USDA activities.
> 2. The introduction of Program Planning Committees . . . at the Department level.

MAURICE M. KELSO *is professor of agricultural economics at the University of Arizona.*

3. The expanded and intensified use of systematic program analysis.
4. The preparation of a documented 5-year program and financial plan [1, pp. 1–2].

Our concern is with the bearing which this elaborate innovation in program planning and budgeting has or may have on appropriations for research in and for making and executing policy for the management and development of the federal public lands. We immediately sense some problems—the public lands are administered by more than one department; the objectives in their management are multiple, some relating to product outputs (grass, timber, recreation, and minerals, for example), some relating to the "conservation and preservation" of the public lands themselves; some objectives of public land management are to affect land management decisions by other public and by private landowners and the decisions by managers of related factor inputs employed in the private use of the public lands; some objectives are concerned with economic efficiency, some with economic equity; some with economic welfare, some with social welfare; some with quantifiable, some with nonquantifiable outcomes. This is indeed a complex "ball of wax" to be adequately "systematized" within one all-inclusive planning and budgeting framework, designed, hopefully, to weigh all gains and sacrifices of relevant alternatives in order to choose one "best" or an array of "better" programs and budgets for the development and management of these public lands.

Feeling reasonably certain that most of you are as unfamiliar as I with the meanings and methods of the system, we best had begin with a brief characterization of the system in order that we may better appreciate PPBS as the context within which public land policy will be made. I am not acquainted with the system by personal involvement, and hence I cannot assert that I know by empirical test whereof I speak; but I am sure that my discussant and those among you who do have such involvement will put me and those of you whom I may lead astray on the right track.

As President Johnson put it in his statement of August 1965 [10, p. 141], the purpose of PPBS is (1) to identify our national goals with precision and on a continuing basis, (2) to choose among those goals the ones that are most urgent, (3) to search for alternative means of reaching those goals most effectively at the least cost, (4) to inform ourselves, not merely on next year's costs, but on the second, third, and subsequent years' costs of our programs, and (5) to measure performance of our programs to insure a dollar's worth of service for each dollar spent.

You will note the emphasis on goals or program objectives, on alternatives among goals as well as among means to attain them, and on minimization of costs or economic efficiency. Thus, the first thing to note about PPBS in contrast to traditional government budgeting is its output (or goal or objective) orientation, whereas traditional budgeting has been oriented to inputs or expenditures. The Planning-Programming-Budgeting

System requires that, as a first step, each program-responsible unit define a set of output-oriented program objectives that cover the total work of that unit. The succeeding steps in the task include the following:

> (1) defining multiyear program goals in specific, quantified terms, with definite time schedules of planned accomplishment; (2) developing a multiyear program and financial plan translating program goals into combinations of agency activities and operations designed to reach these goals most efficiently; . . . and (3) undertaking a continuing program evaluation effort designed to analyze the public need for agency programs and the effectiveness of programs in meeting these needs [10, p. 1].

Formulating the goals for public land policy within, say, the Forest Service depends on the larger policy goals formulated for the Department of Agriculture and, in turn, because of the public land policy goals of, say, the Department of the Interior, on the policy goals formulated for the entire federal establishment. As the Subcommittee on Economy in Government says, though

> PPBS represents a substantial forward step in budgetary techniques . . . much more work is needed in the definition of national objectives and the determination of priorities in the allocation of public funds. If the Nation had a little clearer notion of its goals and national priorities . . . , it would ease the task of PPBS inasmuch as it would give rise to definable objective programs which could then be subjected to a systems approach [8, p. 10].

In spite of this observation by the subcommittee, I find no definitive statement of national goals within which goals of federal public land policy clearly fit. The Public Land Law Review Commission has been established, in part, to arrive at such a definitive federal policy, but that policy is still in the making and is not yet available as an overriding guide. In the meantime, meshing federal land policy as between the Departments of Agriculture and Interior and both with broader welfare goals involving other agencies are bound to be ad hoc, informal, and dominated by the Bureau of the Budget.

The Department of Agriculture has, however, formulated *its* statement of departmental program categories, of which two (out of four) embrace public land policy. "*Category I*—'Income and Abundance' expresses the Department's mission to improve the performance of the American agricultural industry to assure that consumers have adequate supplies of food and fiber at reasonable prices, while farmers receive a fair return on their capital and labor" [1, p. 3]. This category is divided, in turn, into three subcategories, of which only one, called "Agricultural Production Capacity," involves public land policy. It includes activities aimed at improving the productivity of agriculture and the conservation and maintenance of the resource base. Defining range livestock grazing and timber production as part of agriculture clearly places public land policy for these two public land uses within this departmental program category.

"Category IV—'Communities of Tomorrow' expresses the Department's mission to develop and improve rural areas—to achieve a better rural-urban balance" [1, p. 5]. This category includes six subcategories, of which two include public land policy: (*a*) Resource Protection and Environmental Improvement and (*b*) Recreation, Wildlife, and Natural Beauty.

Note that these departmental program categories within which the program objectives of public land policy within the department must fit are expressed in broad public welfare terms—benefits from productivity, from conservation, and from environmental amenities for the people of the nation.

There are other objectives of departmental programs, including those for the public lands, which, though implicit in the above categories and subcategories, are "side listed" by the department as implicit and complementary program objectives—these are called "Resources in Action" (embracing all activities of the department for the conservation and development of natural resources) and "Science in the Service of Man" (embracing all the department's research and extension activities). However, the primary criterion for evaluating program budgets in these two "shadow" categories remains "the relative efficiency and effectiveness of these activities as parts of the larger output-oriented systems" [1, p. 6]. In other words, the test of budget requests for research and for natural resource conservation will be the contribution that such expenditures will make to realization of the pragmatic goals of income, abundance, and environmental amenities.

The structure of output-oriented goals just described, within which public land policy goals must fit, is that of the Department of Agriculture only; I do not have at hand anything similar for the Department of the Interior. But both departments are involved in public land policy; and presumably their individual expressions of such policy must be consistent not only with each other but also with the overriding goals of the federal establishment as a whole. Just how this is achieved is not on its face apparent except insofar as the Bureau of the Budget and, finally, the Congress are effective in achieving it.

Let us consider briefly another aspect of PPBS which appears to bother professional agency personnel. Does PPBS rest solely on quantification, model building, computer analyses, and the attainment of a single-valued, one-best, system-derived answer as to a certain, optimum choice in public land policy? No, it does not. All experts on PPBS are unequivocal on this point. Dr. E. S. Quade of the RAND Corporation points out that the decisions or problems in government decision-making where refined and elegant quantitative techniques can help are highly refined *sub*problems. Analysis of the major, overriding goals involves

> more than efficient allocation of resources among alternative uses; they are not "solvable" in the same sense as efficiency problems in which one can maximize some "payoff" function that clearly expresses what one is trying to accomplish. . . . Decision problems associated with program budgeting are mainly of this type—where the difficulty lies in deciding what ought to be done as well as in how to do it, where it is not clear what "more efficient" means, and where many of the factors in the problem elude quantification. The final program recommendation will thus remain in part a matter of faith and judgment [3].

The Congressional Joint Economic Committee's Subcommittee on Economy in Government argues similarly as to the proper role of PPBS in government decision-making:

> PPBS does not help us much in deciding on ultimate goals for public policy or in deciding between alternative goals. . . . Such basic choices are far beyond the reach of quantitative measure. *Given determined objectives* [italics supplied], cost–benefit analysis or any other systems approach can help us in deciding which alternative would provide the most effective means of achieving an objective. But, we should not expect it to go beyond this. The choice of goals is a basic political decision, arrived at democratically; we should not rely on budgetary techniques to eliminate the hard problem of choice that now confronts both the Congress and the executive branch [8, p. 9].

So much for a minimum, possibly inadequate, description of what PPBS is, why it was established, what it is not. By way of summary, PPBS requires the land policy analyst to express his proposals in the form of objectives or goals to be achieved, to describe an array of alternative activities that in his judgment are among the more relevant means to achieve them, to estimate the probable costs of each such activity over the course of time, to relate the costs or, more broadly, the sacrifices that each alternative will entail to the gains or benefits that each will generate. PPBS implies heavy reliance on quantitative, formally manipulable data but not to the exclusion of relevant nonquantifiable data that can be manipulated only qualitatively and verbally. It implies heavy reliance on economic considerations but not to the exclusion of relevant noneconomic, broadly welfare, value-weighted sacrifices and benefits. Though cost effectiveness and cost minimization and analyses will bulk large in PPBS because of the implicit emphasis on quantifiable, economic analyses, it is not to be confined to such purely efficiency goals.

At this point, however, some opaqueness intrudes, for it is unclear how and to what degree PPBS analytics will be addressed to the hard choices that must be made among alternative goals themselves. Seemingly, the executive branch of the government intends that PPBS shall embrace analyses of these harder questions; it is not so clear that the Congress on the one hand or the agency personnel on the other agree that it can or ought to be carried to this length. Each of these latter two groups, one at each end of the decision-analyzing and decision-making spectrum, seems to feel that such goal analyses either usurp the political decision-making prerogative of the Congress or unduly restrain the agency in marshaling the nonquantifiable, noneconomic arguments in support of its goals or confront it with an impossible task involving the quantitative analysis of those goals. It is salutary to point out that exactly the same unease characterized the professional military men in the Department of Defense in their confrontation with PPBS, instituted by a civilian secretary and his brain trust of bright young systems analysts. In the words of James R. Schlesinger,

> Even where a decision is clear to the disinterested observer, it is difficult to persuade committed men that their programs or activities should be reduced or abandoned. . . . This may be especially true of the military establishment, . . . but it is also true in the civilian world: for conservationists, foresters, water resource specialists, businessmen, union leaders, or agrarians, some aspects of their value systems run directly counter to the claims of efficiency The economic view strikes them all as immoral as well as misleading. . . . Systematic quantitative analysis does not necessarily solve problems. Nevertheless, quantitative analysis . . . eliminates the purely subjective approach on the part of devotees of a program and forces them to change their lines of argument. They must talk about reality rather than morality. Operations research creates a bridge to budgetary problems over which planners, who previously could assume resources were free, are forced, willingly or unwillingly, to walk [4].

Public Land Policy in the Context of PPBS

So far we have devoted our whole attention to that "bridge," described by Schlesinger, over which public land policy planners "are forced, willingly or unwillingly, to walk." We turn now to considerations of what it is that the planners would like to carry in their walk over that bridge and how and in what manner the bridge may affect that which they are permitted or required to carry. What we are concerned with are these questions:

1. Are the dictates of the walk so demanding that the planners can carry over successfully only part of that which they think should be carried or are they required to carry over something which they think is an unnecessary, even impossible, burden?
2. Are the system operators of the bridge so arbitrary in their management of its traffic that they force the planners to transport only such part of their materials as lend themselves to readily quantifiable measurements in order that the bridge operators can readily compute loads, and stresses, and the likelihood of collapse?
3. Is that which the planners would like to transport over the bridge

too big, too heavy, too complex, or too fragile to be accommodated by the bridge design?

In sum, can public land policy be adequately formulated within the constraints of PPBS?

Why, you may ask, would such a qualitative thing as "policy" be affected by a budgeting system that exists solely as a means to request appropriations and authorizations to spend? The reason is obvious once one recalls that "policy" to guide the use, management, and development of the public lands is a product of research, analysis, and planning and that these involve the expenditure of scarce resources, the provision of and authorization to commit which are the product of appropriations. One cannot research, plan, allocate, and manage, let alone invest in development, for the public lands without expenditure of public funds. And, under PPBS, the demand on the public land agency is to show that the public benefit (goal realization) from such requested authorizations is greater (and sufficiently greater) than the sacrifices thereby authorized "to insure a dollar's worth of service for each dollar spent."

Let us recall that the ideal of PPBS requires a showing that any research and planning expenditures for the purpose of formulating any public land management policy, as well as operational and development expenditures required to implement it, will generate not only benefits that exceed the sacrifices incurred thereby and will do so by greater margins than will other alternative programs that might be applied to the public lands themselves but that it also will do so by greater margins than will alternative federal, state, and private programs clear across the board that will be sacrificed by the diversion of funds, public or private, to public land management from these other purposes. The ideal of PPBS is that the requested expenditures for the making and executing of public land policy will exceed all opportunity costs thereof. This, I submit, is a rigorous and exacting demand. No wonder the agency personnel are uneasy under its surveillance, for they are subjected to a discipline of objectivity and reality, eschewing arguments rooted in morality and in subjective feelings for what constitutes the good, the true, and the beautiful. PPBS, "if done critically, but fairly and without bias, can act as a sort of discipline on the agency. It can be compared in many ways to the discipline that competition forces on private business firms. This discipline is characterized by the recurring critical review of operating results" [7, p. 193].

But if this "competition" analogy is applied too narrowly, one of the inherent problems in PPBS as applied to public land policy comes into view. A private business policy analysis is concerned only with the private, individual impact of its decisions on itself. Thus, private decisions are concerned only with direct benefits and sacrifices. The individual decision-maker assesses values to himself of benefits realized by his own sacrifices and acts on that assessment.

When uncritically applied to public land policy, such an approach appraises direct, private market values of altered product outputs relative to sacrifices imposed and derives a private or individual, direct net quantified benefit. Now, as to public lands, particularly as to their renewable natural resource components, such net direct quantifiable benefits per unit area are very small. Hence, the benefit–sacrifice ratios will be small—even, in large numbers of cases, negative; such lands generally will carry, under the private competition analogy, only limited, maybe no, government expenditures insofar as such expenditures are justified by direct net benefits only.

And, because such direct net benefits from expenditures on renewable public land resources are generally so small, the deduction of opportunity costs associated with the public's money expenditures, whether these opportunity costs are calculated at the marginal rate of return on capital funds in the private economy or at the net benefits foregone in precluded federal activities, whichever is the larger, will cause net benefits from public land expenditures on renewable public land resources to gravitate still further toward or into the negative.

The public land managing agency is thus driven, under the analogy of PPBS to a competitive market and by the pressures that opportunity costs impose on the agency's benefit-to-sacrifice calculations, to ferret out other direct and all indirect net benefits, quantifiable and nonquantifiable, economic and noneconomic, that it can in conscience claim for its activities. Let us list some of the relevant possibilities:

1. Management and development activities on the renewable public land resources may enhance the productivity of other lands closely associated with them in use—other public but nonfederal lands and private lands. Net productivity of state or private grazing lands may be enhanced by water developments or grazing allotment policies on the federal range, for example.
2. Public action on the federal lands may reduce or prevent damage to other public and private lands closely associated with them by proximity or use. For example, fire control, or disease prevention, or the reduction of silt runoff from the federal lands may lower risk costs on other lands.
3. Water "produced" by appropriate policies of managment and improvement of federal lands may enhance the quantity, quality, or timing of water flows—consequences that may be of considerable value to other water users, especially in water-short or poor-water-quality areas.
4. Federal public land policies may generate recreational products on the federal or associated other lands. Camping, picnicking, fishing, hunting, boating, wildlife and bird watching, nature walks and nature study,

surcease from urbanism—all these are possible main- or by-products of federal public land activities that may add products of significant value to the net benefit stream of public land policy and management.

5. A corollary of the above may be significant additions to environmental beauty in areas where the federal lands butt up against lands frequented by people for habitation, travel, or employment, a product of apparently growing value in the spectrum of the wants of consumers of sensuous experiences.

6. Enhanced net benefits of all those kinds listed above that are created by public land policies and expenditures may generate "multiplier" benefits to "local," regional, or even national society, though such multiplier benefits may be increasingly difficult to isolate and measure or increasingly dubious as the area of involvement becomes wider. Nevertheless, they may be real and significant to relatively "close up" communities.

7. And, lastly, management and preservation of the biota that compose the renewable resources on the federal lands may have significant values for research and as genetic banks of endangered life forms.

All seven of these nonmarket, even noneconomic, benefits that may flow from the public land agencies' policies and expenditures for public lands have two things in common:

1. They are all instances of externalities and/or of public goods when viewed through the eyes of individual, private decision-makers. As such, they will all be ignored by individual business-type decisions relative to the management and development of the public lands.

2. They are all "products" of the use and development of the public lands, equally with the beef, wool, wood products, and minerals that the direct businessman users of the public lands extract directly from them.

The "bridge" of PPBS must permit the agencies concerned with public land policy to carry across it the net benefits coincident to these products equally with those of the more conventional businessman sort. The net benefits generated by public land policy and by public expenditures must embrace and be augmented by these economic, as well as noneconomic, and by these quantifiable, as well as nonquantifiable, outputs.

I am confident that there would be no disagreement on the part of PPBS practitioners with this argument in its abstract form as stated here. But a nagging uncertainty remains, which I will allude to later, concerning its application in the concrete.

Let us turn, then, to another problem coincident to the above seven classes of outputs that the public land managers would like to carry across the PPBS bridge—research in input-output relations in public land production and the values thereof. Public land policies and management plans will be only so good as relevant knowledge permits. The sine qua non of good policy is research to enhance knowledge. But under the dictates of PPBS, budget requests for research will not be justified by the goal attainment of increased knowledge for its own sake. The PPBS bridge requires that research funding be carried across as part of the bundle labeled "agricultural production capacity" under "Income and Abundance," or "resource protection and environmental improvement" or "recreation, wildlife, and natural beauty" under "Communities of Tomorrow" (in the Department of Agriculture categorization of its goals). Research incident to public land management, then, will be tested on the anvil of pragmatic output goals, which do not include knowledge for its own sake. The analyst, operating under the ideals of the system, is constrained to show the magnitudes of the payoff of research in terms of the more mundane products of food, fiber, income, and beauty.

This is a difficult constraint indeed, for if one knows the payoffs in terms of want satisfactions, the research is unnecessary. Like exploration, research is undertaken because one does not know; if one knows, exploration is unnecessary; if exploration is necessary, one does not know what one will find. How, then, does one present at the PPBS bridgehead a quantified statement of goal attainment from research expenditures in order to be allowed to carry the request across the bridge? I, for one, do not know. Presumably, one might estimate the losses entailed by failure to know but then only in relation to some criterion of idealized "perfect" knowledge; how does one judge the degree to which research planned at some pragmatic level will move the knowledge bank toward the idealized goal? I am confident that, in practice, requests for research funding will largely be tested by a criterion of faith in the value of research to enhance knowledge for its own sake—faith that, by advancing knowledge, socially valuable payoffs will somehow and in the large be realized.

But this is not the formal demand of PPBS. Yet, if the bridge operators are too meticulous in enforcing their own rules, research requests simply will be left at the bridge approach; if research is permitted on and across the bridge, its operators will be modifying their idealized rules in practice. This is another source of unease on the part of public land analysts, which we will allude to further below.

We turn to another area of concern to public land managers in their approach to the PPBS bridge. Public land policy is not only concerned with efficiency payoffs expressed as more products per unit of inputs of capital, labor, and materials. Public land policy is, or should be, equally concerned with a "black box" of equity considerations which, if opened, resembles that belonging to Pandora. I allude to budget requests for research in and for the adoption and execution of policy (1) for new and improved forms of tenure relations among public land users and their government landlord, (2) for the structuring and application of appropriate fee schedules for the use of the public estate, (3) for the establishment of equitable and workable schemes to distribute benefits and sacrifices among affected parties, (4) for payments to local governments in support of local public facilities and services, (5) for the size of private operating units that will be generated or should be facilitated by the allocation of public lands to and among users wherein unit size is appraised in terms not of narrowly economic but of broadly social efficiency and equity, and (6) for improvement in the form and function of the very rationing devices themselves by which the public lands are allocated among the many claimants to their use.

The quantification of payoffs from such policy expenditures is difficult indeed. I do not, in fact, know how it might be expressed in the PPBS idiom. For instance, rationing access to recreation on the public lands by the imposition of fees raises the old specter of price rationing of milk as a result of which it goes to the Rockefellers' cats rather than to economically disadvantaged children. Another for instance: large ranch units using the public grazing or large timber-harvesting firms using the public forests may generate larger returns to the firms and also to all factor inputs directly involved, but also they may entail social sacrifice in the class structure of the dependent community, the cost of providing public facilities and services in the dependent area, and the economic and social stability of earnings received by nonentrepreneurially owned factor inputs (un- and under-employment, for example).

Just suppose that a public land agency, as a result of the findings of a previously conducted applied research effort (we won't inquire into how *that* request got across the PPBS bridge), proposes to institute a revised public land tenure policy and that doing so necessitates expenditures for such things as extensive resource surveys, hearings, educational meetings for users, revision of records, economic surveys, and computerized methods of calculation, billing, and record keeping. Now, of course, that computerized part of the request, as well as some other of its aspects, can be analyzed within PPBS as to whether it is the most efficient way to generate a dollar's worth of equity arising from the revised tenure system. But how do we know what a dollar's worth of tenure equity is? The object (that is, the goal) has something to do with equity in rationing access to resource opportunities through tenure relations as well as with value judgments regarding various tenure forms as means to affect the rationing. I do not know what a dollar's worth of "tenure policy" is—do you? Without knowing, can the public land agency carry this budget request onto, let alone across, the bridge?

This brings me to my next and final point in this disquisition on the hazards confronting public land managers in their approaches to the PPBS bridge. Given the objectives to be achieved by a public land policy budget request, it is possible for the submitting agency to demonstrate that the alternative means proposed for their realization are each efficient in the sense that the cost of each is less than the benefits it will generate, and to appraise the effectiveness with which each means will realize each and all of the objectives. It, thus, is possible for the agency to recommend which program of means be authorized in the light of trade-offs between effectiveness and minimum cost of each in the attainment of each given objective. But the problem is, how does it "justify" one set of objectives among an array of alternative objectives unless they are "given" to the agency, in which case, of course, it need not "justify" them at all.

Means and goals are not distinguishable by their inherent nature. What are "goals" at lower levels of planning and budgeting are "means" to the attainment of a next higher goal. "Goals" of public land management in the Department of Agriculture are "means" to the department's goals of "Income and Abundance" and "Communities of Tomorrow." In turn, such goals of public land management, meshed with parallel goals of the Department of the Interior (and others), are means to the attainment of some higher-level goals of welfare and equity of the federal establishment as a whole. What we have is an endless regression of proximate goals to means to higher goals to means to ever-higher goals, until some ultimate, or at least final, goal is reached. In the absence of knowing what role in this continuous means-ends scheme is expected of public land management, how can the land-managing agency do other than assert its own notions of what constitutes desirable goals which it would like to reach, together, of course, with some measure of the extent to which these goals are effective (as means) in reaching the department's objectives? Quade says, "The first and most important task of the analyst is to discover what the decision maker's objectives are (or should be)" [3, p. 6]. Note that verb "are," plainly implying that goals (objectives) are given—are exogenous—to the planner. Insofar as the objectives are given or exogenous, crossing the PPBS bridge by the analyst is not impossible, for, given the objectives, the choice of means and of criteria to guide that choice, and the analysis of the cost effectiveness of the means to their achievement are, within the limits of knowledge, imagination, and ingenuity, attainable.

But note also that parenthetical verb phrase "or should be." In the absence of given or known objectives, such objectives must be supplied, and the analyst or his agency will supply those that he thinks "should be." His whole PPBS formulation will be tied to those objectives. Suppose that, as his submission reaches higher echelons, his posited objectives do not mesh with other related objectives from elsewhere (the Department of the Interior, for instance) or with higher-level objectives. If this involves change in the objectives as posited by him, his whole PPBS submission may need to be reformulated with altered means and cost-effectiveness analyses, only to be repeated and re-repeated as his submissions reach ever-higher levels of decision making.

And suppose further that the analyst or his agency does not like the objectives "given" to him from "above." Presumably, he would plump for alteration in the given objectives with arguments in support of such alteration, arguments that would rest on his assumptions as to what the higher-level goals are and how his way of stating his proximate objectives would be better means through which to reach those more distant goals. And he would be hard put to formulate his PPBS submission until that debate over proximate objectives for his budget had been settled.

So What Can We Conclude from All This?

PPBS is unexceptionable in principle. Beyond question, it is a step forward in the application of rational sense to program planning and budgeting in the public establishment for public land policy as much as for anything else. But, like all idealizations, it does not by that fact alone insure the attainment of the ideal. It is not a primrose path to perfection. Of course, there is no primrose path to anything in the real world of hard choices in the face of uncertainties, ignorance, and finite minds. So we cannot object to PPBS on that score. To do so would be to commit the error of "nopanaceism" [2].

However, it does present some difficult problems—or nagging worries—or yeasty suspicions—for the analyst or agency concerned with public land management.

First, the worries or suspicions felt by the land managing agencies regarding PPBS derive, in part, from the personalities and value systems of those persons who administer and operate the system. The old idealized adage that government should be one of laws and not of men comes to mind. If those who operate the bridge were mechanistic automata, many of the nagging fears of those who must cross the bridge would be allayed. But they are not and never will be. Laws are made and enforced by men. Government is an institution of men and of men only. The demand, then, is for restraints on the system operators to insure insofar as possible that they operate rationally, knowledgeably, and consistently within reasonably confining rules.

Public land managers, when they approach the PPBS bridge, fear they may confront arbitrariness on the part of the bridge managers in two aggravating ways:

First, the products of public land managmement embrace many that are indirect, stemming from the use and development of the public land resource itself, many that though economic in character are nonquantifiable, and many that are noneconomic. It is easy, under the all-too-human desire for definitiveness and certainty, for the bridge operators to be simplistic in their demands, confining that which they permit on the bridge to analyses comparable to those of private businessmen, eschewing the intangible, the nonmarketable, the noneconomic. In doing so, much that is worthwhile in public land management will be left behind.

Second, personal value judgments and personal knowledge of the bridge operators may admit some and deny others to the bridge in arbitrary and unpredictable ways. If they "like" research, they may admit some PPBS research requests onto the bridge even if they are justified by not much more than goals of "knowledge for its own sake"; at other times or by other men, and respecting other research, research requests may not be so admitted except as definitively linked with a showing of increased public land products that are worth dollar for dollar what they cost.

A high level of self-discipline and humility on the part of the bridge operators will be required to allay this source of unease.

Second among the problems PPBS presents to the public land manager is the worrisome question of how to treat equity problems among the objectives of public land policy. Just how does one determine a dollar's worth of equity benefit in order to lay it alongside the dollar's worth of cost involved in its attainment? I do not know and I suspect that no one knows.

Third, proximate objectives in PPBS budgeting for public land management and policy are but means to higher-level objectives. Bringing the proximate objectives of public land management budgeting into consonance, as means, with higher-level objectives requires an endlessly ongoing iteration of proximate objectives as means to higher objectives and back to proximate objectives again, a consequence of which is a certain continuous element of uncertainty in the choice of means and analysis of their cost effectiveness. The public land manager may feel that he is continuously addressing his PPBS analyses to the wrong objectives.

Fourth, and last, there is legitimate reason for fearing that the PPBS bridge, if too closely controlled, will depress the possibilities of innovation in the making and managing of public land policy. Innovative firms have "what is called 'slack'—uncommitted resources of personnel, finance, material, and motivation. . . . What is needed is flexibility, pluralism, multiple approaches—exactly what a budget-conscious Congressman or an efficiency expert . . . would call duplication or 'overlapping' " [6, p. 52].

Innovation in public land policy is badly needed. Possibly too tight a rein on analysts and agencies by PPBS bridge tenders in their efforts to trim down the fat in materials admitted to the bridge will eliminate too much of the slack that is needed for experimentation, for "feet-on-the-desk" thinking by analysts and managers, for trial-and-error approaches to the solution of problems "where the difficulty lies in deciding what ought to be done as well as in how to do it, where it is not clear what 'more efficient' means, and where many of the factors in the problem elude quantification" [3, p. 4]. As Thompson says, the process of removing slack "does succeed in cutting costs and increasing efficiency. . . . But efficiency is not the final goal in this or any other society" [6, p. 55].

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Discussion: Public Land Policy in the Context of Planning–Programming–Budgeting Systems

HOWARD W. HJORT

My remarks are of two kinds—to broaden the framework within which Dr. Kelso's paper fits and to take issue with a few specifics. When viewed from a broader perspective, I believe most of the concerns expressed by Dr. Kelso become less real.

The Framework

There appears to be an implicit assumption in Dr. Kelso's paper that the PPB man ("planner") makes decisions. This is not the case. The PPB man serves in a staff position. His task is to bring factual information to

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HOWARD W. HJORT *is director of the Planning, Evaluation, and Programming Staff, USDA.*

bear on program issues in a manner useful to those charged with the responsibility for making a program decision.

Machinery has been established within the Department of Agriculture to make sure that those charged with program and policy responsibilities are in fact the ones who make the decisions. PPB staff members serve agency administrators, Program Planning task forces, and the Program and Budget Review Committee. The PPB people are not members of these bodies—they are staff resources set aside on a full-time basis to respond to requests for evaluation, analysis, and program development.

A second implicit assumption appears to be that PPB is synonymous with cost effectiveness analysis. The PPB System is a system—not a technique. Formal analytic techniques are used by PPB analysts. Findings, coupled with logic, theory, and informed judgment, are the heart of the planning process. But even though the planning process is central to PPB, it is only one of three processes necessary to the operation of any system—planning, managerial control, and operational control.

Third, the pros and cons of PPB should be viewed in full recognition of the alternatives. Clearly, the system is not perfect. But program and policy decisions must be made—with or without the PPB System. The key question is, Do those charged with responsibility for making decisions feel more confident that their decision was the right one than they would without the system? I believe that they do. Added staff resources on a full-time basis permit us to explore the options and their consequences more fully. The mission orientation adopted by the department focuses attention upon our program goals and objectives. The task is to combine the things we can do in a way that will most effectively reach the goal of the programs.

Fourth, can (should) PPB help in the goal formulation process? I do not believe that the goals of this nation are—or should be—determined by either the Congress or the Executive alone. Although this is not the time to get into a discussion of the role of the federal government, I am prepared to argue that the goals of the federal government are the goals of the nation. If they are not, the American people will see to it that their elected representatives are replaced by those more in tune with the nation's goals.

A course for the nation's future must be charted. This is not uniquely a federal responsibility, but public servants have a responsibility to help chart the course. The federal employee has a national vantage point from which to appraise the current situation and probe into the future. And if PPB does not help bring the current and potential issues and problems into perspective, I for one believe that we have failed in our responsibilities as public servants.

The PPB System must gather and evaluate information that permits documentation of the magnitude of current and prospective problems. Alternative objectives must be analyzed—the pros and cons of each fully developed—so that we have at least an informed judgment about the potential costs and benefits associated with pursuing alternative objectives at alternative rates of progress. We will never have enough resources to pursue all worthy objectives at the maximum rate of progress.

Fifth, although the department's present program structure has but four major missions at the top, the base of the triangular structure has about 160 specific program elements. And as we go deeper into the structure, the objectives can and do become more specific.

Specifics

1. *Indirect benefits.* We are not driven to account for all indirect benefits. The basic concept of the system—mission or output orientation—turns all these "indirect" benefits into direct benefits. We must account for all benefits to be able to see what we are doing at any point in time in support of our objectives.

2. *Research.* Basic research is not separately identified in the program structure. Nearly all USDA research is mission-oriented. And I find absolutely no rationale for excluding mission-oriented research from the PPB System. The task is to estimate the potential payoff from research and compare this with the estimated cost—precisely the same format as is used to backstop a decision, say, of the wheat allotment. Projecting world grain production and trade two to ten years into the future is subject to considerable uncertainty—probably more than would be associated with an estimate of the potential from research. Yet an estimate of the "most likely" production and trade, and the relevant range, is required to backstop the wheat decision. When matters are uncertain, it is important to quantify the range of uncertainty.

3. *Effectiveness versus efficiency.* These two terms need to be placed in proper relationship. We want to carry out efficiently the most effective set of programs. We evaluate the effectiveness of alternative ways of reaching an objective. Once a way is selected, we want to be sure that it is being done efficiently. But efficiency is in a subordinate position; if dominant, we would not have many programs available to all the people. For example, manpower training programs would not operate in places other than the major metropolitan centers of the nation. More could be trained for the same number of dollars. But we would *not,* in this example, have an effective program because we could not achieve the objective of the program.

4. *More than one department.* Yes, public lands are administered by more than one department. And this is *one* reason for PPB.

Public Lands and Tax Policy

DON SEASTONE*

THE elements of tax policy which I propose to discuss in this paper center around the issues and problems raised by the immunity of federal lands to state and local taxation, and the revenue-sharing and payments-in-lieu-of-tax systems used by the federal government to offset or partially offset this tax loss.

These problems and issues were considered important enough for the Public Land Law Review Commission to decide early in the formulation of its study program to treat them separately through a study designed to identify, among other things, the impact of federal lands on state and local finance.

To review the background of this study briefly, you will recall that the Public Land Law Review Commission, established by the Act of September 19, 1964, has a primary statutory responsibility to "review the policies and practices of the Federal agencies charged with administrative jurisdiction over [the public lands] insofar as such policies and practices relate to the retention, management and disposal of those lands" [2, p. 1].

One of the principal policy areas relating to the retention and management of public lands by the federal government concerns the methods used by Congress to provide federal financial aid to state and local governments because of the tax immunity of property interests of the United States in federal lands within their jurisdiction.

The two methods traditionally used by Congress in providing an offset to the tax immunity of federal lands are (1) the sharing of revenues from the sale of public lands or their resources, and (2) the provision for payments in lieu of the taxes to which the lands would be subjected if they were in private ownership. Although it is not uniformly true, Congress has tended to apply revenue-sharing devices to public domain lands, that is, to those lands which never left federal ownership, and payments in lieu of taxes to lands acquired by the federal government, except for national forests.

The practice of sharing revenues from the sale of public lands began in 1802, when Congress provided that Ohio should receive 3 percent of the net proceeds of the revenues from the sale of public lands in that state.

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[*] The views expressed in this paper are my own and in no way represent the views of the Public Land Law Review Commission.

DON SEASTONE *is resources policy analyst on the Public Land Law Review Commission.*

Revenue sharing with respect to the resources from the public lands began more than 100 years later, when Congress in 1906 provided that 10 percent of the receipts from sales of forage and timber from the national forests should be allocated to the counties in which the forests were located. A payments-in-lieu-of-taxes system appeared in 1919, when Congress authorized the Department of the Interior to make payments equal to current taxes out of the first 75 percent of revenues derived in the reconveyed Coos Bay Wagon Road Grant Lands. Coos Bay lands, like Oregon and California Revested Railroad Grant lands, Indian reservations, and other lands, do not fall within the scope of the Commission study, except for comparative purposes.

Analysis of current legislation indicates a wide range of provisions for revenue sharing, percentage distributions varying from 5 to 90 percent. Some statutes provide for lump sum payments, such as the Boulder Canyon Project Act, under which Nevada and Arizona each receive $300,000 annually from the sale of power from Hoover Dam. Still other legislation provides for federal payments in lieu of taxes measured in terms of a certain percentage of fair appraised value or acquisition costs of acquired lands.

Preliminary review of existing laws and administrative policies also indicates a wide variation in the basic rationale underlying such legislation, the calculation and timing of the amount shared with state and local governments, the recipient of payments (that is, state governments in some cases, county government in others), and other kinds of differences.

Moreover, much of the legislation was enacted prior to significant changes which have taken place with respect to (1) state and local government tax and expenditure policies, (2) direct federal grants-in-aid to state and local governments, (3) direct federal aid which is determined in part by specific consideration of public lands or federal government employment, for example, the Bureau of Public Roads sliding-scale-benefit programs and impacted school grants, and (4) the changing fiscal responsibilities of state and local governments.

All these factors indicated the need for a study to help determine whether and to what extent the distribution of federal land requires, as a matter of equity with states and their political subdivisions, financial contributions by the federal government to support state and local governments, over and above the other federal aid which is available to all states and local governments under existing grant-in-aid programs.

Thus it was that in May 1967 the Public Land Law Review Commission entered into a contract with EBS Management Consultants of Washington, D.C., and New York, to perform this landmark study on revenue sharing and payments in lieu of taxes on public lands.

Features of the Existing Revenue-sharing and Payments-in-Lieu-of-Taxes System[1]

For all practical purposes, the system that exists in the United States today is a revenue-sharing program, since payments in lieu of taxes to state and local governments constitute a small part of the revenue flows from the federal government to state and local government in land-related programs. Although several payment-in-lieu-of-tax programs exist, payments therefrom are less than those from just one of the important revenue-sharing systems such as the National Forest Fund or the mineral-leasing program.

The Department of Agriculture operates three revenue-sharing plans, revenues from stumpage sales on national forest timber being the only one that is significant as a source of local revenue. In the national forest system, 25 percent of the receipts from forest product sales is returned to the county in which the sale is made. Although the 25 percent is nominally figured against gross receipts, two calculations actually restrict the amount of revenues shared. In the first place, collections from timber purchasers to be used for capital expenditures on the subject lands are not included in the gross receipts total; these are the so-called Knutson–Vandenburg collections authorized by Congress in 1930. Secondly, the estimated cost of access road construction and slash removal by timber purchasers are in effect deducted from stumpage price receipts of the Forest Service, reducing gross receipts by that amount.

To give you some idea of the magnitudes involved in this program, in 1966 the gross program receipts from national forest timber sales were about $168 million, and accrued payments to state and, in turn, local governments totaled about $42 million. This is the second-largest revenue-sharing program, exceeded only by mineral leasing.

Knutson–Vandenburg collections in 1966 were nearly $23 million and road construction estimates by timber purchasers about $56 million. If both of these programs were figured somehow in the revenue-sharing formula, revenue-sharing payments by the Forest Service would have been about $20 million larger, or about $62 million.

Two other programs in the Department of Agriculture—on national grasslands and Arizona–New Mexico national forests—represented payments of less than $700,000 in 1966.

The Department of the Interior administers several programs that made payments to state and local governments in 1966, two within the Bureau of Sport Fisheries and Wildlife and most of the others in the Bureau of Land Management. Two programs in the Bureau of Land Management account for most of the Department of the Interior payments—the mineral-leasing program and the payments to the Oregon–California Railroad Revestment land counties.

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[1] The data used in this section are compiled from official sources [3, 4, 7]. Data were also gathered during personal interviews with various federal agency officials, including data originating in the Reports Division, Central Office, General Services Administration.

Mineral-leasing activities are the source of the largest revenue-sharing distribution. From mineral-leasing income, including bonuses and rentals as well as royalties, the Bureau of Land Management distributes 37½ percent to state governments and 52½ to the Reclamation Fund. Unlike the Forest Fund payments by the Forest Service, which are earmarked for county use for schools and highways, the mineral-leasing payments to the states are not earmarked for redistribution to counties. The state of receipt may channel all or none of these revenues to local governments. In fact, there is a wide variety of practices with regard to redistribution of mineral-leasing funds. New Mexico, on the one hand, does not distribute any of the mineral-leasing revenues directly to local governments; rather, the funds go into the state school fund for indirect redistribution to counties. Wyoming allocates 3 percent of mineral-leasing funds directly to the counties of origin and allocates the rest for support of public schools, including the state university. Utah allocates 10 percent of mineral-leasing revenues to the county of origin; Colorado imposes a limit of $300,000 on its redistributions to counties of origin, and California distributes all mineral-leasing income directly to counties of origin.

Mineral-leasing payments to states totaled nearly $48 million in 1966 from Mineral Leasing Act gross receipts of about $125 million. The only exception to the 37½-percent distribution system is the state of Alaska, which receives 90 percent of mineral-leasing income. The 90 percent is derived from the 37½ percent plus the 52½ percent ordinarily paid into the reclamation fund. Apparently because Alaska is not a reclamation state, Congress provided for the more liberal distribution formula.

The other program administered by the Bureau of Land Management which involves a significant transfer of funds to local government relates to the Oregon and California Railroad Revestment lands administered by BLM. These lands, of course, are prime commercial timber areas, and BLM employs a different system for revenue sharing than the Forest Service. From gross sales of forest products, BLM distributes 75 percent to counties within the O&C region, one-third of which is voluntarily returned by the counties for re-investment in the timber land, primarily in BLM timber access roads. Thus, in effect, the counties receive 50 percent of timber revenues and plow back the other 25 percent into resource development.

In 1966, O&C counties received more than $20 million from this revenue source, half as much as was distributed from all national forest timber activities. One of the interesting features of the O&C–BLM partnership is the close cooperation that occurs in planning timber access roads as part of the basic county road system.

Although BLM administers many other revenue-sharing programs, none of them represents an important revenue source to state and local governments. The largest of the other Department of the Interior programs in 1966 was the Migratory Bird Act provisions administered by the Bureau of Sports Fisheries and Wildlife, which distributed about $1.5 million to units of local government.

In 1966, total revenue-sharing and in-lieu-of-tax payments by the federal government totaled about $131 million. Of this amount, three programs—the National Forest Fund, mineral leasing, and O&C lands—accounted for about $111 million or nearly 85 percent. The rest is accounted for in large part by the Bureau of Sport Fisheries & Wildlife program mentioned previously, Corps of Engineers payments growing out of flood control programs, which, in 1966, totaled nearly $2½ million, and Tennessee Valley Authority payments in lieu of taxes. Many other programs exist, for example, Atomic Energy Commission, Bureau of Reclamation, and Federal Power Commission, but their combined payments are relatively small.

One of the interesting phenomena in revenue sharing is the paucity of payments to local governments accruing from BLM-administered public domain lands in Section 3 grazing districts and Section 15 isolated sections created by the Taylor Grazing Act. The payments formula for Section 3 grazing districts calls for the distribution to local government of 12½ percent of program receipts, that is, grazing fees. In 1966 these grazing districts comprised about 152 million acres of the public domain, had program receipts of about $3,800,000, and distributed about $320,000 to local governments. This payment amounted to about one-fifth of one cent per acre on these public domain lands.

On the isolated section lands, those scattered BLM holdings outside organized grazing districts, the formula calls for 50 percent of program receipts to be distributed to local governments. In 1966, there were about 17,000,000 acres of isolated section lands, program receipts of about $554,000, and payments to local governments of about $277,000, or about two cents an acre.

These per-acre payments contrast vividly with some of the other programs, reflecting in part the low productivity of the lands and in part the level of grazing fees. On national forest lands, for example, the average payments on national forests on which some payment was made was 23 cents per acre in 1966; in national forests, moreover, there are many forests, particularly in the Rocky Mountain states where the timber has limited commercial use, on which the per-acre payments are only a few cents. This contrasts to per-acre payments in some Pacific Northwest counties where payments from national forest timber sales amount to several dollars per acre.

As one would expect from the distribution formula, the O&C counties receive the largest per-acre payments of all the revenue-sharing programs —more than $8 per acre. The TVA system, however, which is in fact a combination of revenue sharing and payments in lieu of taxes, made payments in 1966 of more than $14 per acre, figured on the basis of about 725,000 acres of affected lands. This figure, moreover, does not include payments by TVA distributors.

Some of the Pressing Policy Issues Growing Out of the Current System

Probably the overriding policy issue deriving from the present system is whether federal payments to state and local governments should fully compensate these units of government for the tax immunity of federal lands. This statement assumes, of course, that the question of whether or not there should be any federal payments at all because of the tax immunity of federal lands has been resolved in the affirmative.

Examination of the present system reveals a bewildering array of legislative attempts somehow to compensate state and local governments for tax loss due to federal lands. Out of this bewilderment, of course, it is very difficult to formulate a consistent pattern of legislative intent. Some patterns may be identified, however, at least superficially. There appears to be, for example, a tendency for the Congress to treat acquired lands differently from public domain lands. On many acquired-land programs, a variety of payments in lieu of taxes have emerged; thus, an initial conclusion is that for public domain lands Congress seems to prefer revenue-sharing programs and, for acquired lands, payments in lieu of taxes.

The conclusion is sound as long as it isn't pushed too far. Upon closer inspection, for example, the conclusion doesn't apply to lands brought into the national forest system, either by acquisition or exchange. When the Forest Service acquires land by purchase, donation, or exchange, the typical program applied to these lands is the familiar 25-percent revenue-sharing provision. Parenthetically, the exchange program for national forest lands can impose significant burdens on local governments, since the lands acquired by exchange may and often do involve lands in different counties. Thus, a county may find a piece of property off the tax rolls with no compensation, the forest lands relinquished to private ownership occurring in a different county. The 25-percent formula will apply to the new lands, of course; but if they are not commercial forest lands, the revenue-sharing provisions may be slight comfort indeed, since program revenues to be shared may be minimal and afford considerably less revenue than the taxes lost. There is the possibility, of course, that the indirect economic effects of the acquisition through resource program expenditures by the Forest Service and expenditures by national forest visitors may offset the tax loss. But this is an empirical assertion which has yet to be quantified and thus remains unproven and in any case is beyond the scope of this specific Commission study.

Still, it remains true that acquired lands, unlike public domain lands, are often accorded some payments-in-lieu-of-tax treatment. The second interesting feature of these payments in lieu of taxes, however, is that the payments are often tied to the revenues generated by the related resource program. In the TVA system, for example, payments in lieu of taxes are made from a fund financed by 5 percent of gross power sales. In the Coos Bay (Oregon) Wagon Grant program, payments in lieu of taxes are on the basis of full tax equivalency, as long as payments don't exceed 75 percent of the revenues generated by timber sales.

In the revenue-sharing programs, however, the intent of Congress is difficult to identify. Congressional debates, though making it clear that payments are designed to compensate state and local government for tax losses, show no clear pattern of how close to full tax equivalency the payments should be. Indeed, the rationale for allocating such varying amounts as 25 percent of gross revenues from national forests, 37½ percent from mineral-leasing revenues, and 12½ and 50 percent from grazing lands is hard to find. The inevitable result is that payments bear no consistent relationship to the amount of taxes lost because of the tax immunity of federal lands; some state and local governments are probably overcompensated for this tax loss and some undercompensated. Although it does not verify this dichotomy, it is interesting to note that, in 1966, units of government in Wyoming received revenue-sharing payments of about $15 million, where the federal government owns about 30 million acres. The bulk of these payments came from mineral-leasing revenues. In the state of Alaska, on the other hand, where the federal government owns more than 350 million acres, revenue-sharing payments were only about $8 million. Other less emphatic but significant comparisons could be made. The differences reflect such things as variations in productivity of land and the stage of development, but they also reflect the different kinds of programs applied to different kinds of lands; a wide pattern of variation from full-tax-equivalency payments is the inevitable result.

A General Payments-in-Lieu-of-Taxes System?

Perhaps it is for this reason of wide variation in existing programs and their impacts that the attention of the Public Land Law Review Commission is so often called to the possibility of establishing a single payments-in-lieu-of-taxes system for all lands to which its studies apply. There has been a continuing series of suggestions at the public meetings of the

Commission, and from the Commission's advisory council and governors' representatives, that the time has come to unify the heterogeneous programs that currently exist into a single payments-in-lieu-of-taxes program. Most of the suggestions call for full-tax-equivalency payments; others would settle for less than 100-percent parity on tax losses.

The possibility of substituting a single payments-in-lieu-of-taxes system for the present set of heterogeneous programs gives rise to an imposing set of research questions. For example, how much would it cost for the federal government to reimburse state and local units of government for tax loss on federal lands? No one knows. To answer the question requires an assessment of more than 760 million acres of federal lands, a procedure that would constitute the first step in applying the program. Although this tax assessment has never been made, there are some estimates available. In conducting the study for the Commission, for example, EBS Management Consultants made specific estimates for the 50 case counties, and for an aggregate estimate used the so-called Dawson Report [6] of the House Committee on Government Operations, compiled from the real property report of the General Services Administration [5]. This is an attempt by the various agencies to estimate the value of the lands over which they have jurisdiction. For the purposes of the Commission study, it was the only feasible way of estimating the assessed value of federal lands. Should such an alternative find favor in Congress, however, a first step in its implementation would be an assessment of federal lands for tax purposes. The administrative machinery for making the assessment would have to be developed, perhaps along the lines of the procedure currently used in assessing federal lands for tax purposes in the Reconveyed Coos Bay Wagon Road Grant Lands, where a local representative, a representative from the Department of the Interior, and a nonaligned third party make the assessment.

Another question growing out of the possibility of a payments-in-lieu-of-taxes system involves the matter of tax rates to be applied after the assessment problem is resolved. Should local rates be applied or should a national average rate be used? If full local tax equivalency is the goal, then local tax rates should be applied. From the point of view of the federal government, however, this raises questions as to whether the local tax rates reflect variables other than the impact of federal lands on local government, for example, variations in the quality of local services.

A more serious problem, however, is the changing structure of state and local taxes. Since a payments-in-lieu-of-taxes system is based on the value of land owned by the federal government, which is exempt from property taxes, tax equivalency refers to this loss of property taxes. But what about the state government that has no property tax or a minimal reliance on property taxes?

In many instances, the following events have occurred. State government has watched the relative deterioration of local services as local government clings to the property tax base to finance these services, for example, education. In an effort to provide a minimal level of educational services, the state has stepped into the void with a state-financed equalization program, with the result that it will pay, in extreme cases, up to 90 percent of school costs.[2] This state attempt to internalize the external effects of federal land ownership and/or other factors accounting for low economic productivity at the local level will increasingly be financed by income or sales taxes rather than property taxes. What in effect occurs is a substitution of state sales and/or income taxes for increases in local property taxes, a phenomenon passed over by a payments-in-lieu-of-taxes system based only on local property taxes.

This, in turn, gives rise to another fundamental policy question posed by a payments-in-lieu-of-taxes program. To whom should payments be made, state or local government? The quick and easy answer is local government, since this is where the tax loss occurs. But this ignores, of course, the state programs developed with particular emphasis during the last 20 years that have been designed to shift the tax burden associated with quality services to state government. As noted previously, for example, the state of New Mexico does not channel any of the mineral-leasing receipts under the existing revenue-sharing program to local governments. Rather, these funds go into the state equalization program for public schools, along with state taxes, to improve the quality of local schools. A payments-in-lieu-of-taxes system which simply directs payments to local governments, except for the amount of state property taxes, would be in serious danger of ignoring one of the most important fiscal changes in state–local relationships that has occurred in recent years.

Some Other Alternative Programs

To avoid giving the impression that a payments-in-lieu-of-taxes system is the only alternative to the present set of programs, let me conclude by noting some of the other alternatives presented to the Commission at its public meetings. The National Association of Counties has offered the following plan for counties with national forests. The Forest Fund should make payments equal to 25 percent of gross receipts (including Knutson–Vandenburg capital expenditure collections) or, at the option of the county, 25 percent of net receipts (gross receipts less Knutson–Vandenburg collections) plus 10 cents per acre.

The governors of some of the states in the northeast have suggested that all revenue-sharing plans currently in existence should be replaced by the Land and Water Conservation Fund. Under this program, the revenues currently distributed under various plans would all be channeled into the Land and Water Conservation Fund and distributed on the basis called for under that act. For the funds distributed to the states, this means an equal proration of 40 percent of the funds to all states, proration of an additional 40 percent of the funds to states and territories on the basis of population, proration of 10 percent of the funds to states and territories on the basis of federal resources and programs, proration of 5 percent of the funds based on state-reported figures for out-of-state visitor use, and 5 percent distributed to a reserve fund to meet the unforseen needs of the states.

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[2] At the same time that a county is receiving state support, equal to 90 percent of its school expenditures, it may have a per capita property tax greater than the state average [1].

Even the Outer Continental Shelf resources have given rise to revenue-sharing proposals. Senator Long of Louisiana has introduced legislation that would significantly affect the flow of funds to states. Under his proposal, 37½ percent of Outer Continental Shelf mineral-leasing receipts would accrue to the states contiguous to these waters; 62½ percent of the receipts would be distributed to all 50 states on the basis of population. The impact of this proposal can be judged from the fact that, during the 10-year period from 1957 to 1966, total receipts from Outer Continental Shelf mineral-leasing activity, including the amount in escrow, totaled nearly $2 billion. Receipts vary significantly from year to year, but in any one year the receipts dwarf all payments under existing revenue-sharing and payments-in-lieu-of-taxes programs. Moreover, the current programs would remain undisturbed, so that the Outer Continental Shelf payments would represent incremental payments. A variation of this alternative has recently been passed by Congress and at the time of writing was awaiting the President's signature.

These, then, are some of the policy problems and some of the alternatives to the existing system which the Public Land Law Review Commission, and Congress in turn, will be discussing over the course of the coming months. This paper has touched on some of the highlights of just one of the 34 studies that will comprise the background for an important dialogue on public policy for public lands.

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Discussion: Public Lands and Tax Policy

ARNOLD W. BOLLE

The problem raised in Don Seastone's paper is in two parts: (1) how to provide reasonable and equitable federal financial assistance to state and local governments because of the tax immunity of federal lands within local jurisdiction without (2) ignoring important fiscal changes in state–local relationships. His emphasis is on point 1. I believe that it should be on point 2; and I certainly hope that the Land Law Review Commission will attack the problem on the broadest possible basis, for only in that way can it bring some sense into a weird, makeshift situation.

Seastone presents an interesting description of the situation. He impresses us with the wide variety of approaches taken by Congress to offset tax loss to state and local governments because of federal lands in their jurisdiction and the wide variety of ways in which local and state governments distribute and use money received. But none of these arrangements really do the job. The need for the Public Land Law Review Commission is certainly apparent.

Seastone offers no solutions, conclusions, or recommendations, so there is little to argue about with him. He does point out, however, that the problem is more serious, more involved, than just the matter of payments for federal lands to state and local governments.

In my discussion, I will comment first on the approaches now in use: revenue sharing and lieu payments, dwelling on what I consider their weaknesses. I will then discuss the problem in relation to what I consider the broader relevant scope of the problem, and finally, in the brief time allotted, I will suggest some possible approaches.

Revenue sharing (*revenue sharing* here used in a limited sense) and lieu payments, as a means of reimbursing local governments, seem to make sense only in a historical context. We do it because we always did it this way. They represent a patchwork which even in its rich variety, or perhaps because of it, shows a frustrating, but losing, struggle to make it work. It doesn't please the local or federal governments and, in some

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ARNOLD W. BOLLE *is dean of the School of Forestry at the University of Montana.*

cases, seems to shortcut the established governments. Why, for example, should mineral lease revenues continue to be earmarked for reclamation? We could spend all day trying to rationalize that one, but to me it can make sense only on a historic basis.

Income to state and local governments from revenue sharing is irregular and inconsistent, and it establishes a dependency relationship which leads to mismanagement and misallocation of resources. In the final analysis, it works against the broad public interest, particularly in the long run.

The timber industry is characterized by cyclic fluctuations greater than those of industries generally [4, pp. 189–196; 1, pp. 49–53]. The considerable and frequent changes in demand and price and the considerable changes in numbers of firms and volume cut could produce nothing but a cyclic income to local governments.

Even over a period of stable prices, the return may still be variable, particularly to counties, by the rate at which timber is cut in any one area relative to another, as well as by the location of cutting areas and by the timing of sales.

County governments are concerned with at least maintaining revenues and hopefully increasing them to meet the burgeoning demand for services. County governments protest vigorously against reductions. Although they recognize the services provided by the federal government in controlling fire and building roads and recreation areas, they find themselves in serious trouble when revenues drop.

In many areas, revenue sharing sponsors a dependency on income-producing uses of public lands which gives rise to strong pressures for favoring or increasing those uses which produce income rather than uses which do not bring direct return to the federal treasury. At a time when multiple-use management is the keynote, and flexibility to manage the lands to meet the rapidly changing needs of society is essential, we find the institution of revenue sharing working toward rigidly holding to the existing pattern of use. We have a hardening of the categories, to borrow a phrase.

The bias in revenue sharing arises from the irregularity of user fees. As Seastone points out, minerals and timber produce the major revenues. Grazing produces little revenue; water, recreation, and wildlife produce no revenue which is or can be shared with local governments, because there is no user charge for these uses, except the limited charge for recreation. That revenue goes into the Conservation Reserve and is redistributed through the BOR. As you know, timber and certain minerals are sold to the highest bidder. Grazing is on a fixed allotment fee. Water, wildlife, and most recreation are free goods. The fee basis is not sound for determining the benefits of use.

In addition, the demand for increasing revenues to local governments leads to the short-sighted proposal by the Association of County Governments (which I hope Seastone is not seriously endorsing) that counties get 25 percent of gross timber sales, including Knutson–Vandenberg, slash disposal, and road construction costs.

These are improvement investments, "in–out" calculations of appraisals; and a reduction in these items would reduce the investment in public services. Such reductions could lead to deteriorated stands, a reduction in future productivity which, in effect, would accumulate social costs, an action which again is not in the public interest. If counties are really this hard up for revenue, why not tax post offices, highways, schools, hospitals, and even county courthouses?

Lieu payments appear to be an even less desirable means of reimbursing local governments. Seastone shows the tremendous range of such payments and the hopelessness of working out any generally acceptable basis. The great variation of taxation in counties nationally makes solution of the problem impossible. It is obvious that any "average" evaluation would please no one.

If lieu payments are to be continued, perhaps Clawson and Held's proposal for a tax-equivalent payment on federal lands [2, p. 329] might serve as a basis. But I believe that the many exceptions and qualifications which would need to be made would create an administrative nightmare.

My principal objection to an attempt to make the lieu payment the equivalent of the property tax is the acceptance of the property tax as a desirable tax in today's world, a tax which is causing increasing problems throughout the country, a tax which Walter Heller [3, pp. 135–139] calls regressive, inequitable, and inefficient.

Seastone points to the need for greater consideration of the changing needs of states and counties and the importance of meeting the changing needs of local governments. I not only agree with this point of view but would make it the prime basis for consideration of reimbursement to state and local governments.

This is the time for creative federalism and I would hope that the charter of the Land Law Review Commission not only would permit such imaginative leadership but actually would insist on it.

The revitalization of state and local governments is one of the most encouraging developments of recent times. But these governments have difficulties, primarily in raising the necessary revenues. Their problem arises from the fact that their revenue sources are generally property or commodity taxes whose growth is slower than the general economy. They need to place greater reliance on growth sources. Even with these, they will still need to rely on returns from the federal government, possibly some type of refund on income taxes, as Heller proposes, revenue sharing on a far different basis. At any rate, this is the time for a reconsideration of the financing of state and local governments. This is not the time to reinforce outmoded revenue sources by trying to patch up revenue sharing and lieu payments. Grants-in-aid are, of course, an important means for helping states and local government with certain specified programs, but these programs may not provide for the full local needs. They may, in fact, reduce funds for certain essential needs. We need a source of unobligated funds.

Allocation of funds between state and local governments is another part of the problem. Hopefully, reapportionment is pushing the solution of this problem. Resolution of the total problem here is directly involved in governmental reform at all levels.

In fact, in my estimation, while Seastone has given us some excellent insights, he has not yet fully defined the problem. It is very possible that the charter of the LLRC is too limited to permit identification of the total problem. I certainly hope not. One of our main problems in public land management is that agency programs are not broad enough to encompass the problems, and agency administrators are reluctant, or too unimaginative, to recognize the full scope of the problems with which they deal or to make the cooperative arrangements with other groups or agencies necessary to cope with the broader problems. They often do not understand the relationships of their programs to other programs, to the communities in which they operate, or to the broader public which they are serving. It would certainly be too bad if the LLRC were to follow the same regrettable pattern.

Having said this, I now, without fully defining the problem, propose consideration of some other forms of reimbursement to local governments.

As one alternative, the federal government could retain the full revenue and use it in federal programs in the area. I reject this because it bypasses local governments, further devitalizing them, and retains the bias toward income-producing uses.

As a more desirable alternative, I propose a payment based on the return from all uses of the federal land, whether it be revenue-producing or not, with additional payment to cover the costs of the presence of such lands. The payment for uses would have to recognize the return from recreation, wildlife, and water, as well as timber, grazing, and minerals. The evaluation would also need to recognize the trends in such use and the needs for conservation and preservation. It should recognize the growing need of some areas, as primary producers of recreation and space for growing urban communities, and should foster the maintenance of high-quality environments: pure air, water, and scenic values.

This is necessarily a sketchy proposal at this time and I recognize that there are heroic difficulties connected with such a change, but in my mind it at least works toward a sounder basis for reimbursement which eliminates most of the shortcomings of our present system. Most importantly, it would work toward support for sounder land management and would provide a more reliable return to state and local governments.

The creation of the Land Law Review Commission gives us a golden opportunity to bring about some badly needed tax reform. These opportunities come all too infrequently. Evolution and change are a slow and tedious process under ordinary conditions. This is one of our rare opportunities and we should seize it. We should now use our available knowledge and experience to make these federal land counties and states pilot areas for new and imaginative innovation. This is the time for experimentation. Whatever we try will need revision, but we can learn the need only by experience. With this opportunity facing us, it would be sad indeed if by attempting to make do by half measures we only reinforced the old inefficient patterns of property taxes and revenue sharing and rendered them even more difficult to change.

By such innovation now, we would not only create a better and more reliable source of revenue but also take great strides toward revitalizing state and local governments, promote the broader public interest, and advance balanced management of our public lands.

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QUANTITATIVE ECONOMICS

CHAIRMAN: G. M. KUZNETS, UNIVERSITY OF CALIFORNIA, BERKELEY

The Search for Quantitative Economic Knowledge

GEORGE G. JUDGE

WHEN one changes from an angry young man to an ill-tempered middle-aged one, it seems to be the custom to look back over one's field and view with alarm and point with pride. The latter is what I want to do today as it relates to measurement in economics and the search for tools useful in generating quantitative knowledge. My view of where we have been, where we stand, and where we are going will inevitably be a biased one. However, I am sure the discussants will take care of my sins of omission and commission and will set the record straight.

Preliminaries

In the evolution of modern economics from nineteenth-century political economy, many have expressed the ideas that "(1) mathematics, however useful it may have proved in the physical sciences, can play no essential role in the development of the social sciences because the phenomena studied are somehow different—'human beings are not amenable to mathematical law' and (2) the judgment and intuition of the skilled investigator are fundamentally more useful in the social sciences than mathematical formulas based on quantitative observation" [1, p. 129].

In the face of these propositions from the proponents of the qualitative art, perhaps we should ask why economists should try to measure "things." What is it that measuring accomplishes that nonmeasuring does not? It is costly to obtain measurements. Are the returns from the efforts worth the cost?

In framing an answer to these propositions and questions, it is important to realize that in order to explain the relations of so-called economic variables, economics has become essentially a general theory of choice. Moreover, in situations where the choices of individuals are reciprocally dependent, we have been forced to develop a general theory of strategy. If this is true, then one ultimate purpose of economic research is to generate information that may be used to improve economic decision-making or strategy formation. A consumer seeks the best way to buy. A firm seeks

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GEORGE G. JUDGE *is professor of economics and agricultural economics at the University of Illinois.*

the best way to produce. A government seeks the best way to regulate. Thus, since the "decision machine" runs on information, we might say, following Marschak, that "knowledge is useful if it helps us make the best decisions" [4, p. 1].

For most decision problems, it is not enough to know that certain variables are related, since, in the economic sphere, the rallying cry seems to be that "everything depends on everything else." Thus, given some innocuous words such as *scarcity, best,* or *optimum,* this means that if information is to be useful in a decision context, we must know in what direction the relationship runs and be able to answer the important question of *how much?* or at least the probability of *how much.* Thus, measurement of a cardinal and ordinal nature appears operationally necessary.

The Search for Knowledge

Now given the need for quantitative knowledge in economics, how do we go about capturing it? If all of us had I.Q.'s that were 300 standard deviations above the mean, then we wouldn't need to consider the problem—reasoning would be direct and infallible. Since most of us don't fall in this category, we must develop some strategy for the hunt.

If one reviews the history of science, two ways appear to have been employed in searching for knowledge: (1) postulation or logical argument and (2) experimentation or measurement. The structure of the search process for each of these routes is given in Figure 1. Both routes to knowledge have been used individually and in combination, and, in reality, the two approaches are tied together in the sense that conclusions or hypotheses reached via the logical route form the basis for the experimental model. For those so endowed, perhaps a third route, revelation, provides a basis for getting from the real world to the physical conclusions.

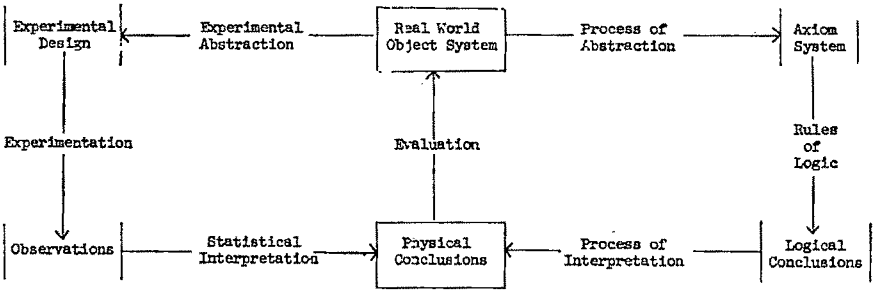

Figure 1. The role of postulation and experimentation in the search for knowledge

Source: This figure is an adaptation of a diagram in an article by Coombs, Raiffa, and Thrall [9, p. 22].

If one looks at the diagram from the standpoint of economics, the way to knowledge through the logical route is clear and the constructs known as *economic theory* and *mathematical economics* are the result. The logical route, of course, only gives us the consequences of the axiom system and tells us nothing about the truth or falsity of the knowledge relative to real-world phenomena. Alternatively, the measurement or experimentation route provides a basis for (1) refuting, refining, or modifying the axiom set of conclusions reached by the logical route and (2) attaching signs, numbers, and reliability statements to events so that they can be used as a basis for decision-making.

From the standpoint of economics, as one looks at the left side of the diagram the experimental restrictions in searching for knowledge become apparent. Experiments give reproducible knowledge, and within the framework of the experimental design the outcome of an experiment can be forecast. Now even though the objectives of the economist are the same as those of the engineer, physicist, etc. (for example, to estimate or predict the effects of a change in structure), his models for the most part are of a nonexperimental nature and his data are like those of the meteorologist. As Marschak [6, p. 2] has observed, the economist is usually asked to estimate the impact of a change in the mechanism which produces his data, and none of these changes can be produced beforehand as in a laboratory experiment. His data are thus generated according to society's experimental design, the outcome of which he can observe but little affect. This situation means that

> economic data are generated by systems of economic relations that are in general stochastic, simultaneous and dynamic. Occurring jointly, these three properties give rise to unsolved problems of statistical inference from the observed data to the relations. Yet these very relations constitute economic theory and knowledge of them is needed for economic practice [6, p. 3].

In addition, in the economic sphere, we know so little about the mechanisms at work that there is enormous arbitrariness in any specification. Economic theory provides several alternative admissible models for explaining economic behavior and does not really help to narrow the range of hypotheses. Combined with this, passively generated data, for which we cannot control variables and isolate relations, are often consistent with a variety of hypotheses. This means there is considerable difficulty in discriminating between alternative hypotheses and some question as to whether or not our theories can be tested or whether the quantitative results have validity for any broader body of data.

Given these pitfalls, should we despair and take our alphas, betas, and imaginary numbers and go home? Let's see how history has answered this question.

A Look at the Past

The early period: 1900–1940

Since about 1850, we have had a steady flow of economic data from the developed countries. In addition, the theoretical foundations of demand analysis are of old standing and date back to Cournot (1838). This theory base plus the availability of data and the need for price–consumption response relations combined to give demand analysis a leading part in the initial phase of econometrics. The early development extended from the turn of this century to the late 1930's, when Henry Schultz published his classic work titled *The Theory and Measurement of Demand* [8]. The investigators during this period assumed that society was performing an experiment which would yield appropriate price and quantity data. Without exception, single-equation statistical models were used.

The statistical study of demand appears to a large extent to be the creation of Henry L. Moore, and in 1914 he published his *Economic Cycles: Their Law and Cause,* in which he presented equations expressing the relations between quantities demanded and the prices of corn, hay, oats, and potatoes and estimated the price elasticity of demand for each crop. Moore's contributions served as a point of departure for the productive work of such men as M. Ezekiel, L. H. Bean, G. F. Warren, F. A. Pearson, H. A. Wallace, F. Waugh, H. Working, and E. J. Working.

Among the pitfalls in demand analysis, two in particular seemed to concern the early investigators. One problem concerned the possibility of deducing statistically the Cournot–Marshall demand curve when only the coordinates of the points of intersection of the demand and supply relations were given at different points of time. The importance of this question was probably strengthened by Moore's claim that the demand relation for the producer's good, pig iron, in a dynamic society is positively sloped. This question and Moore's result culminated in the important paper by E. J. Working titled "What Do Statistical Demand Curves Show?" [8, p. 73]. A second problem reared its ugly head because the classical least-squares approach was a method in which different estimates were obtained for the same parameters, depending on which variable was chosen to play the dependent role. Unfortunately, the relevant demand theory was stated in functional terms and hence treated all variables symmetrically. The problem was neatly summed up in somewhat humorous terms by Henry Schultz as follows:

> If, however, we are asked to determine the effect of a change in conditions of supply—say the imposition of a tariff—on prices, imports and consumption, we need to know among other things the elasticity of demand of the commodity in question, and we cannot, conveniently, say to the legislator "your tariff will have one effect if the elasticity of demand is computed from the regression of price on quantity and quite a different effect if it is derived from the regression of quantity on prices" [8, p. 148].

Thus, early investigators faced the multiple-parameter-estimate dilemma, and the fact that they failed to solve the problem adequately is reflected in the fact that Schultz in his magnum opus reported two demand relations for each commodity—one with price and one with quantity as the dependent variable.

At the same time, work was moving along in estimating the parameters of supply relations. Some of this work, which in the main involved regressing acreage on lagged price, was summarized by J. D. Black in a 1924 *Journal of Farm Economics* article and the work for this period culminated in the famous 1929 article by Bean titled "The Farmers' Response to Price."

Although the early investigators were aware of some of the problems of employing the single-equation regression model, the thing that probably helped most to make the uni-equational models suspect was their failure to predict the stock market crisis and the great depression. In order to patch up the method, a variety of procedures, such as canonical correlation, the variate difference method, confluence analysis, principal components, and weighted regression, were proposed and applied.

During the 1920's and 1930's, attempts were also being made to capture the parameters of production functions. In this connection, the work by Spillman, Black, Jensen, and many others, in regard to physical production functions for the technical units in agriculture, and the industry functions of Cobb and Douglas come to mind. The fitting of statistical cost functions was being pursued, and in this area the work of Joel Dean stands out. Ray Bressler and his associates were developing engineering-statistical plant study procedures as a basis for estimating cost–output functions.

As the 1930's came to a close, attempts were being made to deal with the endogenous generation of economic data, and multirelation models came to the foreground in econometric research. In this period, Tinbergen developed his macro economic model for the Netherlands (1937) and the United States (1939). About the same time, Leontief developed an input–output analysis to make it possible to take into account the interdependence between the sectors of an economy and permit structural analysis. In regard to the work by Tinbergen, it is interesting to note that, although economic theory suggested that economic data are generated by systems of equations and Tinbergen reflected this characteristic in his multirelation models, the development of statistical methods consistent with this specification was at this time an unsolved problem.

The start of modern econometrics

The 1940's were an exciting period in the development of quantitative economics. In formulating statistical models consistent with the way in which economic data are supposed to be generated, a milestone was reached in 1943 when two articles were published in *Econometrica* by

Haavelmo [6, p. 425] and Mann and Wald [6, p. 426] and Haavelmo wrote his monograph entitled *The Probability Approach to Econometrics*. Basically, Haavelmo converted the economists' simultaneous equation model to a statistical model by assuming a random disturbance for each equation and specifying the distribution of these random variables. Mann and Wald suggested a large sample solution to the estimation problem arising from the new formulation. On the applied side, Girshick and Haavelmo [4, pp. 92–111] completed their classic article on the demand for food (1947) and there was a feeling that we were well on our way to formulating methods to cope with the interesting questions posed by Working in 1927. Anderson and Rubin (1949) developed the "limited information" estimator and derived its large sample properties. Koopmans (1949) faced up to the problem of identifying each mathematical equation as a definite economic relation and discriminating between alternative competing structures. Marschak (1947) made clear the need for structural estimation if the results were to be useful for policy purposes and suggested decision models for making use of empirical results. The work culminated in a monograph edited by Koopmans [6] which summarized the state of the tools of quantitative knowledge after the developments of the 1940's. From an applied side, Klein completed his work on a sophisticated macro economic model of the U.S. economy, and agricultural economists were beginning to make use of the new techniques. Computational burdens with the new techniques were significant: electronic computers were being talked about in an "Alice in Wonderland" context, and the hand calculator was still the main workhorse of the number generators.

About this same time, Samuelson published his book on the *Foundations of Economic Analysis*, Von Neumann and Morgenstern introduced the profession to game theory, Wald alerted us to statistical decision theory, Dantzig developed the simplex algorithm for use with linear optimizing models, and Leontief published his book on the structure of the American economy. Economists were discovering and beginning to make use of inequalities and the tool of real linear algebra.

These advances started repercussions from which we are still recovering. Economic theory was reformulated and extended in terms of modern mathematics. General equilibrium theory experienced a revival and we had about as many new proofs of the existence of competitive equilibrium as we had budding mathematical economists. Activity analysis gave new approaches to old price and allocation problems and mathematical programming became a working tool of the applied economist. We started thinking about optimal decision rules for decision units in agriculture, industry, and government, and some people were starting to look at inferential statistics within the context of a decision problem under uncertainty.

In the area of economic and statistical models, Wold questioned the

Haavelmo view of data generation and proposed the recursive and causal chain economic and statistical models. He also raised questions on the philosophical foundations of econometrics and caused us to rethink our position on the elusive word *causality*. As alternative systems of equation estimators, Theil proposed the two-stage least squares and *k*-class estimators. The addition of these estimators to the econometrician's tool chest meant that we had reached the stage of multiple parameter estimates for any given economic model, and just as the early econometricians had asked the question, *Which regression?* we now had to ask, *Which estimator?*—isn't progress wonderful! The thing that made the answer to this question difficult was that for the system of equations estimators, only the asymptotic properties were available and many of the estimators were asymptotically equivalent. However, for economists who usually have to work with small samples of data, finite sample results are essential. Thus, in order to get some idea as to the performance of the alternative estimators in finite samples, simulation or sampling experiments were proposed and carried through for certain specialized models. The progress via this route was slow, and at the 1958 winter meetings the Econometric Society sponsored a panel discussion under the pleading title: "Simultaneous Equation Estimators—Any Verdict Yet?"

In the 1950's, several macro economic models were constructed, estimated, and used [7]. There was hardly a major country that couldn't boast one or more econometric models, and Wold in an unpublished paper reports that at a meeting at the Vatican, these models even received a blessing from the Pope. The electronic computer became a reality and did much to reduce the computation burdens of the multi-equation models. This operational possibility of substituting capital for thinking permitted the individual researcher to consider and implement a wider range of economic and statistical models and sample time periods.

Since the 1940's had made us so acutely aware of the necessity for consistency between the assumptions underlying economic and statistical models, a large amount of effort went into asking "if"-type questions, such as the following: If relevant variables are omitted from the equation, what is the impact on the properties of the estimates? If the disturbances are autocorrelated, how will the efficiency of the estimator be affected and how can we mitigate the impact of this specification error? What is the impact on the properties of the estimator if the assumption of homoscedasticity is not fulfilled? What are the implications of stochastic rather than fixed regressors?

Asking the question of how to specify models consistent with the dynamic characteristics of economic data led to the specification of distributed lag economic models and the attendant problems of estimation [3]. The work of Koyck, Cagan, and Nerlove stands out in this development, and their formulations led to the application of the distributed lag model in estimating the short- and long-run parameters of behavior equations. The practical difficulties of distinguishing between different lag schemes when using nonexperimental data was early recognized, and to a large extent the problem still exists today.

Questions relating to the economic and statistical impact of using aggregate economic data and relations have an early origin, and intuitively most people feel that aggregating data involves a loss of information. Thus, an especially important work was the 1954 book by Theil in which he dealt with the problem of interpretation of macro relations estimated from aggregate data, when the observed data are generated from a set of micro relations. One of his major results was that when macro variables are obtained by simple aggregation (aggregate result postulated to hold independently of the micro relations), the expectation of the macro coefficient estimator will depend on a complicated combination of corresponding and noncorresponding micro coefficients. As a result, Theil raised the question of whether we should abolish the macro models and estimates. Alternatively, Klein in 1953 showed that when the macro and micro relations are derived so that they are consistent, then the macro variables are weighted averages of the micro coefficients. If the weights are stable over the course of time, then no aggregation bias results. However, the usual case is for the weights to change over the course of time. It is interesting to note that, in spite of the discouraging words of Theil and Klein, macro econometric model building and estimation continued at full pace during the 1950's.

Given the questionable virtue of the macro data, in the late 1950's much effort went into generating more complete micro data over the course of time. Data panels and banks were set up and sample surveys and controlled experiments were instituted in capturing these data. From an estimation point of view, this expanded data base made it imperative to develop estimating methods which would permit the combining of cross-section and time-series data. In the 1950's, covariance analysis, usually through the use of dummy (zero-one) variables, provided the major estimating technique, although extraneous estimators were being talked about and actually applied by Tobin and others.

Given the development in the 1950's of the various linear and nonlinear decision and simulation models under certainty and uncertainty [2] and the formation of operations research and management science, the need for hard quantitative knowledge at all structural decision levels was emphasized and econometrics started serving these new masters.

The last decade

If the forties and fifties were instrumental in emphasizing the role of the economic model (the sampling model that generated the data) in determining the appropriate statistical models, the sixties have made us aware of the problem of developing statistical models which are appropriate for economic decision problems—the fruit of an idea introduced by Wald in the forties. It was suggested that if econometric models are constructed and estimated as a source of information for decision-making, then the theory of statistical decision, based on an analysis of losses resulting from incorrect decisions, can and should be used.

For economic data, which are, by and large, nonexperimental in nature, the statistical decision theory problem is that of making the "best" decision on the basis of a given set of data, when θ, the true state of the world (parameter), is unknown. A number of solutions have been proposed for this statistical decision problem. Under the traditional inferential school of thought, the class of decision rules (estimators) is typically restricted to those that are unbiased. In conventional estimation theory, where a quadratic loss function is assumed, this approach leads to minimum variance unbiased estimators. However, the notion of unbiasedness, although intuitively plausible, is an arbitrary restriction and has no connection with the loss due to incorrect decisions and is thus unsatisfactory from a decision theory point of view. In any event, as the decision theorists noted, the conventional sampling theory approach does not always lead to an optimal decision rule (estimator).

In contrast to the traditional school, one of the more exciting approaches to the decision problem is the so-called Bayesian solution. In this approach, the decision-maker's prior information about the state of the world or parameter θ is combined with the sample information y to make the best decision. It is assumed that the investigator's information or uncertainty about some parameter θ can be summarized in a prior probability function $p(\theta)$. This information is then combined with the sample density function $p(y|\theta)$ to yield a posterior probability density function $p(\theta|y)$. Then, given a loss function, say $L = L(\theta - \hat{\theta})$, which reflects the losses due to an incorrect estimation, the Bayesian choice of a point estimate is the one that minimizes the expected loss, where the posterior distribution of θ is used in the expectation.

Given this framework, and building on the work of Jeffreys, Savage, and Raiffa and Schlaifer, Zellner and associates developed a Bayesian formulation of the regression model with extensions to cover the problems of autocorrelated errors, distributed lags, prediction and decision, and multi-equation systems [5]. Preliminary simulation work in comparing the performance of the Bayesian estimators with their sampling theory counterparts has been quite encouraging. In regard to gauging estimator performance, it should be noted that many of the sampling theory estimators have only asymptotic justification, whereas the Bayesian approach yields exact finite sample results. In addition, since nonexperimental observations are our main data source, one might seriously question the criterion of using "performance in repeated trials" as a basis for rationalizing sampling theory approaches. One problem of applying Bayesian decision theory is finding a set of prior distributions rich enough to incorporate the investigator's knowledge but simple enough to be algebraically tractable. However, modern methods of numerical analysis have done much to change the definition of what is tractable.

Alternatively, within the spirit of combining prior and sample information, several sampling theory estimators have been developed in the last few years for the regression models, and the following alternative specifications have been considered [5]: (*a*) when the prior knowledge concerning an individual coefficient or a group of coefficients is exact in nature, then the methods and test statistics proposed by Wilks, Tintner, Theil, and Chipman and Rao may be employed; (*b*) if the prior information on an individual coefficient or a group of coefficients is of a statistical nature, with known finite mean and variance, then the methods and test statistics proposed by Durbin, Theil and Goldberger, and Theil, which make use of Aitken's generalized least-squares technique, may be employed (for this formulation Theil has developed a statistic to test the compatibility of the prior and sample information); (*c*) when the prior knowledge is less complete and information exists only in the form of inequality restraints, which specify individual or linear combinations of the coefficients, then one possibility when placing a prior upper and lower bound on a coefficient is to specify a mean and variance for the parameter which would give a very low probability to values outside of this range. Under this specification, the resulting information could be used in the same way as Theil and Goldberger use prior knowledge of a statistical type, and Aitken's generalized least-squares estimator could be applied. Alternatively, when the prior information consists of linear inequality restraints on the individual coefficients or combinations thereof, then, following Judge and Takayama, the problem may be specified and solved as a quadratic programming problem. The minimum absolute deviations (linear programming) estimator is still another alternative specification.

These models permit the investigator to take account of any prior information about the unknown parameters that exists via the routes of postulation, experimentation, or revelation. When a certain minimum amount of information is available concerning the structure of the relation(s), these estimators appear to be one way of coping with the troublesome problem of multicollinearity. The sampling properties of the inequality-restricted least-squares estimator are yet to be established, but initial Monte Carlo sampling studies yield encouraging results relative to its performance. These estimating methods can be extended to handle the cases for a multivariate regression system and a simultaneous equation system.

While not all the technical and philosophical problems in this area have been solved, these procedures appear to offer promise in our search for "optimum" estimators and suggest systematic ways for proceeding as we attempt to learn from our experience and data.

The dynamic and stochastic nature of economic data has recently led several to suggest that our observations may be viewed as generated by a stochastic process—that is, a process that develops in time or space according to probabilistic laws. This proposition has led many to the use of a first-order stationary Markov process as the appropriate probability model when the observation at any time is the category in which an observation falls. The object of this type of analysis is to use the time-ordered movements of the micro data as a basis for estimating the transition probability system. The parameters of the probability system are then used as a basis for summarizing the dynamic characteristics of the data, predicting future outcomes and the long-run equilibrium of the system. This type of model has found many applications, ranging from gauging social mobility to the size distribution of firms.

One problem in making use of this model is that, in many cases, the data for the micro units are not available and only their aggregate counterparts (proportions in each state) exist. In order to use the aggregate data as a basis for estimating the behavior system for the micro data (transition probabilities), Miller and later Telser formulated the problem within the least-squares framework. Building on this work, Lee, Judge, Cain, and Zellner developed restricted-least-squares, maximum-likelihood, and Bayesian estimators of the transition probabilities. Simulated sampling studies with these estimators have shown that each of the estimators gives a "good" performance when the aggregate data are generated by a first-order Markov process.

In terms of other new estimators, Zellner formulated an Aitken-type estimator for handling the case of sets of regression equations where the disturbances between equations are related and the regressors vary over equations. This formulation provided the basis for the Zellner and Theil three-stage least-squares simultaneous equations estimator. In the 1960's, several Monte Carlo sampling studies were completed, and we have gradually learned a little more about the finite sample properties of the alternative system of equation estimators.

Macro economic models became bigger and, we hope, better, and the theorist, applied economist, statistician, and mathematician started to cooperate in the venture of model specification, estimation, and modeling. In addition to trying to capture parameters, quantitative economists appear to have taken on the responsibility for seeing that their numbers make sense. For most results, simulation experiments are now set up and carried through in order to see whether the outcomes of the estimated systems are consistent with observed behavior and expected results. This further testing of our models through modeling can only improve the usefulness of the results and raises the interesting philosophical question of whether simulation procedures, which iterate on parameter systems, may not be one meaningful way to capture unknown parameters or systems.

In regard to enriching the data base by using both time-series and cross-section data, Balestra and Nerlove, Mundlak and Wallace, and Hussain have specified a components-of-error model whereby the regression error is assumed to be composed of three independent components—one with time, one with the cross section, and one overall component in both the time and cross-section dimensions. Chetty has reformulated the cross-section time-series problem along Bayesian lines.

In the last few years, time-series analysts have added the tool of spectral analysis, which is based on the idea of decomposing a stochastic process into a number of orthogonal components, each of which is associated with a given frequency. These methods are in general possible when the variances and covariances are independent of time. Cross-spectral methods which deal with relations between variables are of great importance to economists but at this time are the least developed.

On yet another front, economists began to question the invariance of their parameter systems over time, individuals, etc., and, as a result, quantitative economists have started to consider the random-coefficient statistical model as a basis for coping with this problem. This model, in addition to introducing more realism into our specification, may also be a fruitful way of looking at and dealing with the aggregation problem.

In the search for the Golden Rule of accumulation, growth theory has received much emphasis and many alternative models have been specified. The aggregate production function which expresses the basic relationship among output, employment, and capital stock has been the basis for a large number of studies on technical change and economic growth. In the search for an aggregate relation which would recognize capital accumulation as the main propellant of economic growth, the CES and the generalized production function have been proposed as a replacement for the C–D production function. For the production function at the micro level, much effort has gone into investigating the properties of the C–D function under various economic and statistical specifications [10].

Mathematical programming and all types of decision models under certainty and uncertainty reached the teen-age stage in specification and application. The simple price and allocation equilibrium models of the fifties gave way to more elaborate self-determining systems for micro and macro analyses. Computers became larger and faster and, because of this and decomposition procedures, models containing what in the 1950's would have been an unbelievable number of equations became an operational possibility: we now, for example, talk in a casual way about a national model of agricultural production response. These models have made explicit the need for usable parameters from all types of technical and behavior relations. These optimizing models have helped to provide a balance between description and prescription—that is, tools to aid in the search for predictable regularities in human affairs and tools that yield information to agents on actions that best serve their interests.

The Road Ahead

If what we have achieved is prologue, then we should be in for some exciting times ahead. The students appear to be getting smarter and the quantitative training on the average is getting better. Social science research is getting a better break at the funding table and, in economics, faculties are beginning to have a fuller appreciation of the complementarity between teaching and research. The business schools have begun serving industry and are starting to play the role that the experiment stations do for agriculture. Today, the faculties of several business schools are doing some of the best theoretical and applied quantitative economic research, and their role will probably become more important in the future.

Given this base, it seems apparent that we will continue to refine and develop our economic and statistical models to cope with the special problems of our sample data and the decision problem for which the results are to be used. We should continue to improve our knowledge of the finite sample properties of the sampling theory estimators and learn more of the implications and possibilities for combining prior and sample information for the purposes of estimation, prediction, and control. Nonlinear estimators and random-coefficient statistical models will be further developed and become standard equipment in the econometrician's tool chest.

The use of Bayesian inference, estimation, and decision processes will grow rapidly in our search for "optimal" actions (estimators), and perhaps ten years from now everyone will be at least a residual Bayesian.

Dynamic and stochastic decision models will grow in sophistication and usefulness. The use of modeling and simulation procedures will continue to grow very rapidly and we will be simulating everything from the operation of a small firm to the economy of a developed or developing nation. Modeling in regard to macro econometric models will increase in importance as a tool to gauge the relative performance of alternative estimators and models and to understand the meaning of our results.

Future methods and models will probably make use of systems or control theory which combines, in one package, automatic or adaptive control, estimation, prediction, and some optimality criteria. Since these procedures yield one basis for the study of a system evolving in time and/or space and can be made to reflect the characteristics of an economic system, they appear applicable as a decision or planning model for a variety of problems in the economic sphere. The exciting and, I believe, productive development within this context is the possibility of combining the estimation and optimization problems. This is an important consideration, since an economic system moves through time and thus the parameters defining the system may change. How do we then utilize any new information to re-estimate the parameters of the system and make use of them in conjunction with the target or utility functional, to choose, from among the available instrument or control variables, the ones yielding an optimal solution? These procedures have worked well for other types of systems and, given our penchant for adaptation and refinement, I think that there is room for much optimism here.

Data will continue to be a problem, but since the model builders and users are now getting together, there are many reasons to be optimistic in regard to an improvement in quantity, form, and accuracy. We are starting to talk about generating data from large social experiments (for example, the three-year experiment in New Jersey regarding the negative income tax proposal) and the foundations are starting to listen. The next ten years should see a flow of much more usable experimentally generated data, and the possibilities for looking at major actual or potential structural changes in the developing nations as experiments are intriguing.

In regard to computers, after several years of growing the baby is now ready to be born and even the boldest of imaginations regarding the offspring will probably prove to be very, very timid. At the University of Illinois Computer Development Center, we are about a year away from a computer that has the capacity of about 1,000 small computers. It is designed to handle such things as very large programming problems and will, for example, assuming that it is meaningful, invert, say, a 10,000 × 10,000 matrix. I am sure that other computers nearing completion or on the drawing board have even more fascinating possibilities.

Despite the productive efforts of many men, much of our modern economic theory is a theory of position and not of movement. This means that we must develop a more workable theory of change. To do this, we will have to be more concerned with leads and lags, with intertemporal relations among phenomena and the dynamic mechanism of transmitting impulses. As before, we will probably proceed by finding bits of order here and there and gradually combining these bits into a systematic picture of the whole.

Concluding Remarks

We are now at the end of a very inadequate tour. When I finished putting together these remarks, I was impressed by how hard the problems were and are, how far we have come in the quantitative area, and how much agricultural economists have contributed in regard to tool sharpen-ing and applications. The last fifty years have been a very important experiment in nonexperimental model building, and our achievements in theory and applications have made economics a leader of the nonexperimental sciences. Our future performance as a science will depend on how well we ultimately fulfill the prescriptive goal of helping peoples and their governments to satisfy their social and economic aspirations. This goal is best served by a science that provides an understanding of the regularities of economic life and can use this information as a basis for prediction, control, and choice. In the quest for this kind of a science of economics, development and application of tools of quantitative analysis are essential.

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Discussion: The Search for Quantitative Economic Knowledge

A. N. HALTER

Judge's paper gives us an excellent review of the tools available to the agricultural economist in his quest for quantitative economic knowledge. He says that these tools are useful in the quest for knowledge through the logical and experimental routes of his Figure 1. However, as he points out, the agricultural economist is restricted in his use of the experimental route because society is in charge of the experiments and not the scientists, as is the case in many of the physical and biological sciences. At the same time, Judge says that the results produced by the agricultural economist must be useful to the decision-making members of society. By *useful*, I presume he means that society will be better able to design experiments that contribute to the scientist's quest for knowledge. Or does he mean that the experiments will increase the utility of the decision-maker; or does he mean both an increase in knowledge and an increase in utility?

There are a number of philosophical questions that can be raised if we are willing to face up to them. I would like to raise some of these questions in the context of Judge's Figure 1. First, let me discuss a few additional features that I would add to the diagram, and then I will pose the questions.

I would draw a line from the Experimentation box to the Real World Object System to show that the performance of society's experiments (individual and group decision-making) have an impact upon the real world. This emphasizes the complication for the investigator, as pointed out by Judge, that the real world is constantly being modified. Next, I would draw a dotted line from the Physical Conclusions box to the Experimental Design box to show the flow of information from the analyst to the decision-makers (action-takers).[1] Now let us write in the outputs of the various boxes that are relevant to (1) the analyst and (2) the decision-maker.

The analyst specifies an *a priori* probability distribution for a hypothesis (logical conclusion) in the process of empirical interpretation. Let us denote this by $P(H)$. This distribution arises because of the uncertainty in the specification of the mathematical model. In the process of statistical interpretation, which includes building a statistical model, the analyst specifies a likelihood function or, as Judge calls it, a sample density function. It is a probability distribution which specifies the probability of

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[1] I would also put another arrow head on the line pointing toward the Physical Conclusions box from the Real World Object System to illustrate that, in the process of evaluation, there must be a partitioning of the *a priori* facts between those used for empirical interpretation and those used for testing of the physical conclusions, that is, a separation of input data from that used for testing the output of a mathematical model.

A. N. HALTER *is professor of agricultural economics at Oregon State University.*

evidence given the hypothesis. The hypothesis is the same one as specified by the Logical Conclusions box.[2] I will denote it by $P(E_a|H)$, where E_a stands for the evidence (observations) which the analyst has at his disposal. The output of the Physical Conclusions box is the posterior probability distribution $P(H|E_a)$ given by Bayes' formula. This is the analyst's contribution to the decision-making process.

The decision-maker, in his process of abstracting from the real world, specifies another prior conditional probability distribution, namely, $P(H|E_d)$ where E_d is the evidence that the decision-maker has about the real world on his own volition. To make decisions, the two distributions $P(H|E_d)$ and $P(H|E_a)$ must be combined into a joint distribution $P(H|E_a$ and $E_d)$, that is, if the analyst's information is going to be used at all. Thus, for the analyst's information to be useful to the decision-maker, someone has to figure out how to obtain the joint distribution $P(H|E_a$ and $E_d)$. In spite of Judge's pointing with pride at the historical record of development of econometric tools, he did not evaluate how successfully the results of econometric work have been incorporated into decision-making. There is a good reason for that omission. It is that very little effort has gone into deriving the joint probability distribution, $P(H|E_a$ and $E_d)$. Efforts that have considered this distribution have assumed the decision-maker's distribution $P(H|E_d)$ and the analyst's distribution $P(H|E_a)$ to be independent, a highly unlikely situation. The issue here, then, is this: Should econometrics, and specifically agricultural economists, be concerned with the derivation of the joint distribution?

Another question that arises, after looking at the quest for quantitative knowledge in this framework, is, How does the analyst make a choice among likelihood functions, $P(E_a|H)$, in the process of statistical interpretation? In the formulation of a statistical model the analyst must specify a likelihood function which he believes characterizes the experimental observations. How does he test among the ones from which he can choose? Judge refers to his work, wherein different prior distributions are assumed. But why not question the likelihood function as well as the prior distribution?

Then, finally, there is the question of how the analyst knows when he is making a contribution to the decision-maker. Do we say that if a decision-maker has a choice between two alternative actions (experiments) and he would choose action a_1 using just the distribution $P(H|E_d)$, whereas he would choose a_2 using the joint distribution $P(H|E_a$ and $E_d)$, then the analyst has made a contribution? Answering this question in the affirmative is tantamount to saying that the analyst is helping the society to perform the "right" experiments, that is, consistent with the knowledge in hand.

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[2] This contention could be emphasized in the diagram by drawing a line from the Logical Conclusions box to the Statistical Interpretation process.

On the Problem of Degrees of Freedom in the Analysis of Consumer Behavior*

ALAIN DE JANVRY AND JURG BIERI

The Problem

THE existence of a gap between theoretical models and empirical analysis in economics has been generally recognized. In the analysis of consumer demand, this gap is such that the classical model does not yield workable relationships for measurement purposes because of a lack of degrees of freedom. This deficiency stems from an insufficient specificity in the hypotheses that structure the concepts of the model. In particular, the type of utility function and the optimization process that are assumed to hold in the classical model are of such a level of generality that, except for consistency, they do not restrict appreciably consumer choices and can only provide an ex post rationalization for most observed behaviors. By contrast, and further contributing to the deficit in degrees of freedom, the specification of context within which the model is expected to hold is so specialized that it precludes the possibility of observing repetitions of the same choice process.

In the present paper, we propose a way of dealing, at least partially, with the problem of degrees of freedom in the measurement of consumer demand and consumption, while remaining in the framework of a model of utility maximization.

Review of Some Proposals

The number of degrees of freedom available in the estimation of a set of parameters from a given body of data is equal to the difference between the number of observations and the number of estimable parameters. Hence, there are two means of action that can be followed to increase the number of degrees of freedom, each one applying to both the data base and the theoretical model postulated:

1. Increase the number of observations available. In terms of the data, this requires in particular the gathering of longer time series and of cross sections over the course of time, such as obtained in consumer panel surveys. In terms of the model, this means broader specifications of context, enabling in particular the combination of time-series and cross-section data. This possibility has been exploited by Marschak [19], Tobin [29], Stone [25], and others.

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ALAIN DE JANVRY *is assistant professor of agricultural economics, and* JURG BIERI *is acting assistant professor of agricultural economics, both at the University of California, Berkeley.*

2. Decrease the number of parameters in the model at least to the number of dimensions of the estimation space. This may be obtained on the data by making use of Hicks's theorem [15, pp. 312–313] to build up composite commodities. More effectively, this can be obtained by making more specific the components of the model: utility function, behavioral rule, and budget constraint.

In making the utility function more specific, two approaches have been followed: one consists in specifying additional properties that the utility function must satisfy, the other in specifying wholly the functional form of the function.

Additional properties to be satisfied are the ones implied by the hypotheses of separability introduced by Leontief and Sono. A systematic classification of the various types of separabilities was provided by Goldman and Uzawa [12]. The implications of these additional properties on demand parameters have been exploited in three different ways:

1. The total differentials of the system of demand equations are taken at one equilibrium point, and the restrictions on demand parameters implied by separability imposed *a priori*, thus reducing considerably the number of independent parameters to be estimated. Differentials are, for estimation purposes, replaced by first differences, and the resulting local model is expected to hold approximately. This approach has been attributed to the "Rotterdam School" (Goldberger [11]). Barten [4], Barten and Turnovsky [5], and Theil [28] used in this fashion the hypotheses of point-wise, block, and almost additivity.

2. Functional forms of demand equations are specified arbitrarily, and the restrictions on parameters available from utility theory, including the separability hypothesis, are imposed *a priori*, either exactly (Boutwell and Simmons [7] used strong separability) or approximately (Powell [23] used additivity and imposed the corresponding *a priori* restrictions at the sample mean only).

3. Direct use of the restrictions on demand parameters, implied by the separability hypothesis, is made to derive additional parameters from a set of known ones. Johansen [17] and Amundsen [2] used point-wise additivity to derive all price elasticities from the knowledge of income elasticities and of one-price elasticity. Brandow [8] used strong separability to scale the cross-price elasticities between foods and nonfoods relative to the income elasticities.

Complete specification of the functional form of the utility function has been used in a number of empirical studies. Most forms used imply stringent restrictions on the substitution terms and on the form of the Engel functions. Houthakker's direct-addilog function [16] is additive. The consequences of direct additivity are either that all goods are normal and substitutes for each other, or that one good is normal and a substitute for all others, with all other goods being either inferior or complementary to each other or neutral and unrelated to each other (Green [14]). In terms of demand parameters, it implies that the ratio of the price elasticities of any two items with respect to a third one is equal to the ratio of the income elasticities of these two items. The indirect-addilog utility function, also developed by Houthakker, implies that the ratio of the price elasticities of any two items with respect to a third one equals one. The Stone–Geary specification (Stone [24], Stone, Brown, and Rowe [26], and Parks [22]) is also an additive utility function and implies linear Engel curves. The demand equations are nonlinear and must be fitted iteratively. A transformation of this function that has been used is the exponential (Tsujimura [30]). The quadratic utility function implies linear Engel functions and does not allow for strong and weak separability, since the Hessian matrix is assumed fixed. It is, nevertheless, among functional forms that have been used, the least restrictive one on the nature of the substitution terms between items. The demand functions are nonlinear and difficult to fit. Tsujimura and Sato [31] obtained fits under the assumption of additivity (Gossen function), and De Janvry, Bieri, and Kuznets [9] proposed approximations to enable estimation without separability restrictions.

We do not know of any attempts at empirical analyses where use has been made of more specific formulations of the behavioral rule and of the budget constraint than in the classical model.

A Model

The model presented in this paper both specializes the assumptions of the classical model and generalizes its specification of context in the following manner:

1. The utility function is assumed to be a multiperiod, separable function, where separability may be postulated both between items demanded in different time periods and between items belonging to different categories of expenditures in the same time period.

2. The maximization process is assumed to be performed stepwise through budgeting over time periods and categories of expenditures, because of the consumer's inability to maximize directly. Determination of group expenditures is made on the basis of the consumer's "total resources" and group price indexes. This type of optimization has been described by Strotz [27]. Further, we know from the "Le Chatelier Principle" that a higher level of utility cannot be reached through stepwise maximization than through direct maximization. We consequently require that the optimizing quantities determined through budgeting be consistent with the ones determined from direct maximization of the same multiperiod, separable utility function. The conditions to obtain a consistent budgeting have been set forth by Gorman [13].

3. The utility-maximizing group-expenditure levels are assumed to be determined from the utility-maximizing changes in group expenditure from the previous-period equilibrium level, in response to changes in prices and income. Determination of these changes is exact for infinitesimally small changes in prices and income, and approximate, with an error of the second order of smalls (Gorman [13, p. 469]), if price and income changes are small. Hence, we have a model that does not describe fully the determination of new equilibrium levels corresponding to new price and income levels. In particular, if the equilibria observed are at yearly or quarterly intervals, the levels of group expenditures at these points may be disconnected, because no record is available of the successive adjusting steps that took place between two consecutive observed demand patterns.

4. The group utility functions are assumed to be of quadratic form, with parameters independent of the quantities demanded.

5. All individuals within a certain stratum of the population (sociological, ethnical, geographical,) are assumed to have the same intertemporal separable utility function, up to a set of characteristic variables z, explicitly introduced in the utility function, which account for individual differences (social, family, and individual characteristics) among consumers in the stratum.

Consider a well-behaved mutiperiod utility function,

$$u(q_{\mathrm{I}}, q_{\mathrm{II}}, \cdots, q_{S-1}, m_S, z),$$

which is assumed to hold, at time $t=\mathrm{I}$, for all individuals within a certain stratum. We denote by $S-1$ the expected life span (or horizon) from period I; by $q_R(R=\mathrm{I}, \cdots, S-1)$, the n_R-dimensional vector of quantities demanded in period R; by m_S the bequests or terminal assets; and by z a vector of consumer characteristics. The budget constraint that restricts each individual's optimization behavior is (Modigliani and Brumberg [20])

$$y_o + y_{\mathrm{I}}^* + \sum_{R=\mathrm{II}}^{N} y_R^*/(1+i)^{R-1} = m_{\mathrm{I}} + \sum_{R=\mathrm{II}}^{S-1} m_R^f/(1+i)^{R-1} + m_S^f/(1+i)^{S-1},$$

where

y_o is the individual's net worth carried from the previous period,

y_{I}^* is the current nonproperty income,

N is the earning span from period I $(N \leq S-1)$,

y_R^*, $R=\mathrm{II}, \cdots, N$, is the expected nonproperty income $R-1$ periods ahead,

i is the rate of return on assets, which can be assumed constant without essential loss of generality [32, p. 305], and

m_R^f is the expenditure allocated to future period R.

For simplicity, let us rewrite

$$y_0 + y_{\mathrm{I}}^* = y_{\mathrm{I}};$$

$$\sum_{R=\mathrm{II}}^{N} y_R^*/(1+i)^{R-1} = y_{\mathrm{I}}^e,$$

the expected discounted future income as seen from period I; and

$$m_R^f/(1+i)^{R-1} = m_R \qquad (R = \mathrm{II}, \cdots, S).$$

Since y_{I}^e is not observable, let us assume that it can be expressed as a function of current resources and of a set of consumer present and future characteristics, z^*, not already introduced in the utility function,

$$y_{\mathrm{I}}^e = f(y_{\mathrm{I}}, z^*).$$

Specific functional forms have been given to this relationship by Friedman [10], Nerlove [21], Zellner, Huang, and Chau [33], Modigliani and Brumberg [20], Ando and Modigliani [3], and others.

Now, each period's expenditure must equal the sum of the expenditures on individual items within that period, that is,

$$m_R = \left(\sum_{r \in R} p_r^f q_r \right) / (1+i)^{R-1}$$

where p_r^f is the expected price for item r in period R. Hence, if we denote by $p_r = p_r^f/(1+i)^{R-1}$ the discounted prices, and by m the present value of total resources, the budget constraint that applies to the maximization of the postulated multiperiod utility function is

$$m \equiv y_{\mathrm{I}} + f(y_{\mathrm{I}}, z^*) = \sum_{R=\mathrm{I}}^{S} m_R \equiv \sum_{R=\mathrm{I}}^{S-1} \sum_{r} p_r q_r + m_S.$$

Since we further assume that the utility function is separable into time periods,[1] the Slutsky substitution terms K_{rk} between items r in period R and k in period K will assume the restricted forms

$$K_{rk} = \theta(\partial q_r/\partial m)(\partial q_k/\partial m), \quad r \in R, \quad k \notin R,$$

under strong separability and

$$K_{rk} = \theta_{RK}(\partial q_r/\partial m)(\partial q_k/\partial m), \quad k \in K \neq R, \quad \text{with } \theta_{RK} = \theta_{KR},$$

under weak separability.

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[1] The utility function can also be separable into categories of expenditures within each period. Since we show in the next section that separable groups can be aggregated into one group, there is no loss of generality in developing the argument with separability over time periods only.

Stepwise Maximization Under Local Aggregation

We now introduce Strotz's concept of budgeting in the maximization of a separable utility function. Maximization in stages is a naturally simplifying process when the decision-making involves the determination of the optimum level of a large number of variables, which is the case in demand. Further, when multiperiod choices are considered, an allocation of total resources to time periods is first performed, followed only by an allocation of expenditures within the present period to individual items. In other words, all the consumer needs to know in a multiperiod decision process is how much to spend in this period versus future periods and then how to allocate present-period spendings over commodities. In the next period, say period II—if we assume, as Blackorby [6] showed that it is logical to do, that the consumer follows over the course of time a "naïve optimum path" where the optimum intertemporal allocation of expenditures is determined through a new maximization at each point in time—then the quantities demanded will be based on a new allocation of money to period II, different from what the consumer expected to spend in period II as seen from period I. Hence, the detailed allocation of future spendings to future quantities demanded is an overly complex task that reasonably cannot, and need not, be performed.

Since the consumer is aiming at a maximum of utility, one required characteristic of the budgeting process will be that it yield the same optimizing levels of demand as the ones determined from direct maximization. This is referred to as the *consistency* property of two-stage maximization.

Further, for this budgeting to be behaviorally meaningful, we require that it can be performed on the basis of group price indexes. The existence conditions for these indexes were set forth by Gorman [13]. It turns out that these conditions are rather stringent on the utility function since they imply that all separable groups be homogeneous in their arguments, that is, that all group-expenditure elasticities be equal to one, an unacceptable requirement.

A weaker condition on the existence of group price indexes is obtained if we only require that they hold *locally*, that is, in differential form. All that can be determined on this basis are consistent adjustments in expenditures and demand around one equilibrium point, in response to small changes in prices and income. If these adjustments in budgeting are to be performed on the basis of a vector of S local group price indexes, then the utility function needs to be strongly separable; if they are to be performed on the basis of an $S \times S$ matrix of local group price indexes, then weak separability is sufficient. As we shall see, the strategy for estimation of demand and consumption proposed here only requests local aggregation.

Hence, the two-stage maximization process which we consider is the following:

In the first stage, adjustments in group expenditures from one equilibrium point, $m_R^o (R=\mathrm{I}, \cdots, S)$, can be performed, on the basis of infinitesimal changes in the group price indexes, $dP_R (R=\mathrm{I}, \cdots, S)$, and in income:[2]

$$dm_R = \sum_{K=\mathrm{I}}^{S} (\partial m_R/\partial P_K)dP_K + (\partial m_R/\partial m)dm + (\partial m_R/\partial z)dz$$

$$\left(R = \mathrm{I}, \cdots, S, \quad \text{with } \sum_R dm_R = dm\right).$$

The adjusted expenditure levels are then $m_R^0 + dm_R$, $R=\mathrm{I}, \cdots, S$.

If the price and income changes are small, the adjustment process is not completely described by the above equation, but only the changes along the tangent surface to the expenditure function at one equilibrium point. There remains an omitted adjustment corresponding to the divergence between the tangent plane and the expenditure function, though of the second order of smalls.

We often observe only distant equilibrium points (quarterly, yearly), and hence these points may not possibly be connected by adjustment-in-expenditure equations. But the first-stage parameters needed to correct second-stage slopes can be estimated from cross-section data only at each such equilibrium point. Hence, the fact of observing disconnected expenditure patterns does not preclude estimation of demand parameters if cross-section data are available at each equilibrium point of interest.

By contrast, the second-stage demand equations are

$$q_r = q_r(p_{R1}, \cdots, p_{Rn_R}, m_R, z),$$

where $m_R = \Sigma_r p_r q_r$ are the adjusted group-expenditure levels. These equations can be fitted directly from time-series data on equilibrium patterns of demand, whatever the interval of observation. Assuming quadratic group utility functions, the estimation procedure described in our mimeographed paper [9] can be followed.

Short-run forecasts of demand are obtained from

$$q_r^f = q_r(p_{R1}^f, \cdots, p_{Rn_R}^f, \hat{m}_R, z^f),$$

where $\hat{m}_R$ is projected along the tangent plane at the last observed equilibrium point, in terms of forecast changes in group price levels and in total resources from this last point,

$$\hat{m}_R = m_R^o + dm_R(dP_\mathrm{I}^f, \cdots, dP_S^f, dm^f).$$

The local group price indexes $dP_R (R=\mathrm{I}, \cdots, S)$ are derived in the next section.

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[2] To simplify notations, and without loss of generality in the exposition, the vector z is written as a scalar.

The Definition of Local Group Price Indexes Under Strong Separability

A set of S local group price indexes of the form

$$dP_R = \sum_{r\in R} w_r dp_r,\ w_r = w_r(p_1, \cdots, p_n, m) \qquad (R = \mathrm{I}, \cdots, S),$$

such that locally consistent two-stage maximization can be performed, will exist if (Gorman [13, p. 471])

$$\frac{\partial m_R/\partial p_k}{\partial m_R/\partial p_{k'}} = \frac{(\partial m_R/\partial P_K)(\partial P_K/\partial p_k)}{(\partial m_R/\partial P_K)(\partial P_K/\partial p_{k'})} \equiv \frac{w_k}{w_{k'}}, \quad \text{independent of } R.$$

This condition is satisfied under strong separability. Further, since consistency is then obtained, the changes in group expenditures dm_R determined through direct maximization are equal to the ones determined on the basis of group price indexes. This gives us a means of finding the coefficients w_r in the local price indexes.

The total differential of direct maximization demand equations are, under strong separability and using Slutsky's decomposition,

$$dq_r = \sum_{r'\in R} K_{rr'} dp_{r'} + \theta \frac{\partial q_r}{\partial m} \sum_{K\neq R} \sum_k \frac{\partial q_k}{\partial m} dp_k$$
$$+ \frac{\partial q_r}{\partial m}\left(dm - \sum_{R=\mathrm{I}}^{S} \sum_r q_r dp_r \right) + \frac{\partial q_r}{\partial z} dz, \qquad r \in R.$$

Multiplying by price, and summing over all items in group R, we get

$$\sum_r p_r dq_r = \sum_r \sum_{r'} K_{rr'} p_r dp_{r'}$$
$$+ \left(\sum_r p_r \frac{\partial q_r}{\partial m} \right)\left(\theta \sum_{K\neq R} \sum_k \frac{\partial q_k}{\partial m} dp_k + dm - \sum_R \sum_r q_r dp_r \right)$$
$$+ \left(\sum_r p_r \frac{\partial q_r}{\partial z} \right) dz.$$

But, from the budget constraint,

$$\sum_R \sum_r K_{rr'} p_r = 0 \quad \text{and} \quad \sum_R \sum_r p_r(\partial q_r/\partial m) = 1$$

(Engel aggregation equation).

Hence,

$$\sum_r K_{rr'} p_r = -\theta \frac{\partial q_{r'}}{\partial m}\left(1 - \sum_{r\in R} \frac{\partial q_r}{\partial m} p_r \right).$$

Substituting into the demand equation, and denoting

$$\sum_r p_r(\partial q_r/\partial m) = \partial m_R/\partial m \quad \text{and} \quad \sum_r p_r(\partial q_r/\partial z) = \partial m_R/\partial z,$$

we get

$$\sum_r p_r dq_r = -\theta \sum_{r\in R} \frac{\partial q_r}{\partial m} dp_r + \frac{\partial m_R}{\partial m} \sum_K \sum_k \left(\theta \frac{\partial q_k}{\partial m} - q_k \right) dp_k + \frac{\partial m_R}{\partial m} dm + \frac{\partial m_R}{\partial z} dz.$$

Thus, the change in group expenditure,

$$dm_R = \sum_r p_r dq_r + \sum_r q_r dp_r,$$

obtained from direct maximization is

$$dm_R = -\sum_{r\in R} \left(\theta \frac{\partial q_r}{\partial m} - q_r \right) dp_r + \frac{\partial m_R}{\partial m} \sum_K \sum_k \left(\theta \frac{\partial q_k}{\partial m} - q_k \right) dp_k + \frac{\partial m_R}{\partial m} dm + \frac{\partial m_R}{\partial z} dz.$$

Hence, if we define the local group price indexes as

$$dP_R = \sum_r \left(\theta \frac{\partial q_r}{\partial m} - q_r \right) dp_r \bigg/ \frac{\partial m_R}{\partial m}, \tag{1}$$[3]

these indexes satisfy Gorman's aggregation conditions,

---

[3] Barten and Turnovsky [5] define

$$\sum_r p_r dq_r = dQ_R$$

as a group quantity index and

$$\sum_r (\partial q_r/\partial m) dp_r / (\partial m_R/\partial m) = \sum_r (\partial q_r/\partial m_R) dp_r = \widetilde{dP}_R \text{ (say)}$$

as the corresponding group price index. We then obtain

$$dQ_R = \left(\sum_r \sum_{r'} K_{rr'} p_r p_{r'} \right) \widetilde{dP}_R + \theta \frac{\partial m_R}{\partial m} \sum_{K\neq R} \frac{\partial m_K}{\partial m} \widetilde{dP}_K + \frac{\partial m_R}{\partial m} \left(dm - \sum_{R=1}^{S} \sum_r q_r dp_r \right) + \frac{\partial m_R}{\partial z} dz \tag{2}$$

as a first-stage demand function. Since individual prices still enter directly into this equation, it shows that there does not exist a vector of group price indexes on the basis of which the equilibrium dQ_R's can be determined. If the equilibrium dQ_R's are desired, as in Barten and Turnovsky [5], then we need to define an additional set of group price indexes $dP_R^* = \sum_r q_r dp_r$. We can then either use these and the $\widetilde{dP}_R$ indexes in (2), or use them to correct dm_R obtained from the previously developed indexes in $dQ_R = dm_R - dP_R^*$.

$$w_{r}/w_{r'} = \left(\theta\frac{\partial q_r}{\partial m} - q_r\right) \Big/ \left(\theta\frac{\partial q_{r'}}{\partial m} - q_{r'}\right), \quad \text{independent of } K.$$

The first-stage adjustment-in-group-expenditure equation is then

$$dm_R = -\frac{\partial m_R}{\partial m}\left(1 - \frac{\partial m_R}{\partial m}\right)dP_R + \frac{\partial m_R}{\partial m}\sum_{K\neq R}\frac{\partial m_K}{\partial m}dP_K + \frac{\partial m_R}{\partial m}dm + \frac{\partial m_R}{\partial z}dz.$$

Because of consistency, the first-stage budget constraint, $\sum_R dm_R = dm$, is satisfied, and the sum of any $S-1$ expenditure equations equals the last one if $\partial m/\partial z = \sum_R \partial m_R/\partial z = 0$. The complete system of first-stage expenditure equations can consequently be written as

$$dm_R = -\frac{\partial m_R}{\partial m}\left(1 - \frac{\partial m_R}{\partial m}\right)(dP_R - dP_S) + \frac{\partial m_R}{\partial m}\sum_{K\neq R}^{S-1}\frac{\partial m_K}{\partial m}(dP_K - dP_S) + \frac{\partial m_R}{\partial m}dm + \frac{\partial m_R}{\partial z}dz, \qquad (R = \mathrm{I}, \cdots, S-1),$$

with

$$dm_S = dm - \sum_{R=\mathrm{I}}^{S-1} dm_R, \quad \frac{\partial m_S}{\partial m} = 1 - \sum_{R=\mathrm{I}}^{S-1}\frac{\partial m_R}{\partial m}, \quad \frac{\partial m_S}{\partial z} = -\sum_{R=\mathrm{I}}^{S-1}\frac{\partial m_R}{\partial z}.$$

We can aggregate any number of groups, say groups R and R', into a separable aggregate. Let

$$dm_{R+R'} = dm_R + dm_{R'},$$

$\partial m_{R+R'}/\partial m = \partial m_R/\partial m + \partial m_{R'}/\partial m, \partial m_{R+R'}/\partial z = \partial m_R/\partial z + \partial m_{R'}/\partial z,$ and

$$dP_{R+R'} = \left(\frac{\partial m_R}{\partial m}dP_R + \frac{\partial m_{R'}}{\partial m}dP_{R'}\right) \Big/ \left(\frac{\partial m_R}{\partial m} + \frac{\partial m_{R'}}{\partial m}\right).$$

Then, the first-stage aggregate-group expenditure equation is

$$dm_{R+R'} = -\frac{\partial m_{R+R'}}{\partial m}\left(1 - \frac{\partial m_{R+R'}}{\partial m}\right)dP_{R+R'} + \frac{\partial m_{R+R'}}{\partial m}\sum_{K\neq R,R'}\frac{\partial m_K}{\partial m}dP_K + \frac{\partial m_{R+R'}}{\partial m}dm + \frac{\partial m_{R+R'}}{\partial z}dz.^4$$

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[4] The case of weak separability is not presented in this paper, but can be developed analogously. An $S\times S$ matrix of local price indexes would be required, since the indexes are functions, through θ_{RK}, of both the equation and the group to which they refer.

Estimation of Price and Income Slopes Under Strong Separability

The two-stage price and income slopes are

$$\partial q_r/\partial p_{r'} = (\partial q_r/\partial p_{r'})_{m_R} + (\partial q_r/\partial m_R)(\partial m_R/\partial P_R)(\partial P_R/\partial p_{r'})^{5} \qquad (r, r' \in R),$$
$$\partial q_r/\partial p_k = (\partial q_r/\partial m_R)(\partial m_R/\partial P_K)(\partial P_K/\partial p_k) \qquad (r \in R,\ k \in K \neq R),$$
$$\partial q_r/\partial m = (\partial q_r/\partial m_R)(\partial m_R/\partial m).$$

Or, from the first-stage expenditure equations and the definition of local price indexes,

$$\partial q_r/\partial p_{r'} = (\partial q_r/\partial p_{r'})_{m_R} + (\partial q_r/\partial m_R)(1 - \partial m_R/\partial m)(q_{r'} - \theta\partial q_{r'}/\partial m),$$
$$\partial q_r/\partial p_k = -\ (\partial q_r/\partial m_R)(\partial m_R/\partial m)(q_k - \theta\partial q_k/\partial m),$$
$$\partial q_r/\partial m = (\partial q_r/\partial m_R)(\partial m_R/\partial m).$$

Further, from the difference between two first-stage expenditure equations, we get

$$dm_R/(\partial m_R/\partial m) - dm_K/(\partial m_K/\partial m) = dP_K - dP_R \quad (\text{all } R = \text{I}, \cdots, S \neq K).$$

Replacing the local price indexes by their definition, we get

$$\theta = (\widetilde{dQ}_R - \widetilde{dQ}_K)/(\widetilde{dP}_K - \widetilde{dP}_R) \tag{3}$$

where $\widetilde{dQ}_R = \sum_r p_r dq_r/(\partial m_R/\partial m)$ and $\widetilde{dP}_R = \sum_r (\partial q_r/\partial m_R)dp_r$.

There are hence three sets of parameters that must be estimated:

1. We must estimate the second-stage demand parameters $(\partial q_r/\partial p_{r'})_{m_R}$ and $\partial q_r/\partial m_R$ $(r = 1, \cdots, n_R)$ at each equilibrium point. These parameters appear in the total differential of the second-stage demand equations evaluated at one equilibrium point,

$$dq_r = \sum_{r' \in R} (\partial q_r/\partial p_{r'})_{m_R} dp_{r'} + (\partial q_r/\partial m_R)dm_R + (\partial q_r/\partial z)dz.$$

One could follow the "Rotterdam School" by postulating that this equation holds approximately over successive equilibrium points, and replace differentials by observable first differences. This approximation is obviously not satisfactory, in particular for forecasting purposes, if the demand functions are highly nonlinear and we use data that cover long time spans.

A preferred approach is consequently to postulate a functional form for the group utility function. Since we desire a form that does not imply any further kind of separability within separable groups, use of a quadratic utility function was suggested in a previous paper [9]. Estimates of the second-stage parameters are then obtained at each equilibrium point.

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[5] The symbol $(\ )_{m_R}$ means that m_R has been held constant in differentiating.

2. We must estimate the first-stage parameters, $\partial m_I/\partial m$, also at each equilibrium point. This can be done from cross-section data within the population stratum over which the utility function is assumed to hold. At one equilibrium point, prices are constant over individuals, and the first-stage adjustment in expenditure function can be integrated into a function, $m_I = f(m, z)$, that holds for each individual in the stratum, at a given point in time, with fixed parameters. Fit of this function yields estimates of $\partial m_I/\partial m$ at each level of income.

3. We must finally estimate θ. Once the second-stage expenditure slopes and the first-stage parameters $\partial m_I/\partial m$ have been estimated at one equilibrium point, θ can be obtained in equation (3) from observations on prices and quantities at two adjacent points in time.

When these three sets of parameters have been estimated, estimates of all price and income slopes at each equilibrium point are obtained.

From Demand to Consumption

Analytical derivations of the consumption function from utility theory have been obtained, in the literature, at the cost of stringent restrictions on the quantity–price relationships. Basically two approaches have been followed in this respect: one is to postulate that relative price changes have no effect on consumption (Klein [18, pp. 40–50]), the other that perfect aggregation is obtained within separable groups in the utility function (Modigliani and Brumberg [20]). This first approach has been strongly criticized by Ackley and Suits [1] as being unjustified. As we saw previously, the second approach implies hardly admissible restrictions on the group-expenditure elasticities of individual items.

In the present model, where neither of these two restrictions is introduced, no derivation of the consumption function can be obtained, since there exists no first-stage expenditure function. By contrast, we obtain a derivation of the envelope to the consumption function from the first-stage adjustment-in-expenditure equations. The marginal propensity to consume can consequently be estimated at each equilibrium point for which stratum cross-section data are available, and forecasts of levels of consumption obtained along the tangent plane to the last observed equilibrium point.

Aggregating, as described above, all time periods other than the present one into one "future" period, the first-stage adjustment-in-expenditure equation becomes

$$dC = -(\partial C/\partial m)(1 - \partial C/\partial m)(dP_c - dP_{fc}) + (\partial C/\partial m)dm + (\partial C/\partial z)dz,$$

where

$dC = dm_I$ is the change in consumption,

$dP_c = dP_I$, and

dP_{fc} is the aggregate price index of future consumption.

Hence, since $m=y_I+y_I^e(y_I, z^*)$, then

$$dC = -(\partial C/\partial m)(1-\partial C/\partial m)(dP_c - dP_{fc}) + (\partial C/\partial y_I)dy_I + (\partial C/\partial z^*)dz^* + (\partial C/\partial z)dz,$$

and the marginal propensity to consume for the stratum is $\partial C/\partial y_I$.

Short-run forecasts of consumption can then be obtained from

$$C^f = C^o + dC(dP_c^f, dP_{fc}^f, dy_I^f, dz^{*f}, dz^f).$$

Discussion and Illustration

The central features of the model that has been presented here stem from the assumptions of strong separability and of stepwise maximization. As we saw, there exist, in this case, only local price aggregates given in equation (1). Consequently, we cannot derive demand and consumption functions in this model since only local properties are obtained. The envelopes of these functions can be estimated from historical data, and forecasts of demand and consumption can be obtained along the envelope at the last observed point.

To arrive at a formulation of the demand and consumption functions in a stepwise maximization model, we need to assume, in addition to (weak) separability, that all subfunctions in the utility function are (after normalization) homogeneous of degree one in their arguments, since perfect price and quantity aggregates then exist. Forecasts are simply obtained from estimates of the demand and consumption functions on historical data.

Let us assume, then, that the intertemporal utility function,

$$U = U[f_1(q_1), \cdots, f_S(q_S), z],$$

is weakly separable into linear homogeneous functions $f_R(q_R)=f_R(q_{R1}, \cdots, q_{Rn_R})$. From Euler's theorem,

$$f_R = \sum_{r\in R} (\partial f_R/\partial q_r)q_r,$$

and substituting for the first-order conditions for maximization in the second stage, where λ_R is a Lagrange multiplier, we get

$$f_R = \lambda_R \sum_r p_r q_r = \lambda_R m_R$$

from the second-stage budget constraint. Hence, in order to have $P_R Q_R = m_R$, we can define as group price and quantity indexes

$$Q_R = f_R(q_R), \qquad P_R = 1/\lambda_R,^6$$

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[6] Note that λ_R is the marginal utility of expenditure in group R and that this price index is very restrictive. Indeed, all perfect group price indexes that are not constructed on the basis of Hicks's theorem would have to be equal to this one to have a right to existence.

where $\lambda_R=\lambda_R(p_{R1},\cdots,p_{Rn_R})$ is homogeneous of degree -1. The group expenditure elasticities, $(\partial q_r/\partial m_R)(m_R/q_r)$, are unitary for all $r\in R$ and the matrix of within-group price slopes $(\partial q_r/\partial p_{r'})_{m_R}$ is symmetric for all $r, r'\in R$. The first-stage demand functions are then of the form

$$Q_R = Q_R(P_I,\cdots,P_S,m,z) \qquad (R=I,\cdots,S).$$

The two-stage income and price slopes now are

$$\partial q_r/\partial m = (q_r/m_R)(\partial m_R/\partial m) = (q_r/m_R\lambda_R)(\partial Q_R/\partial m) = (q_r/Q_R)(\partial Q_R/\partial m),$$

where $\partial Q_R/\partial m$ is the first-stage income slope;

$$\partial q_r/\partial p_{r'} = (\partial q_r/\partial p_{r'})_{m_R} + (q_r/m_R)(\partial m_R/\partial P_R)(\partial P_R/\partial p_{r'}) \qquad (r, r'\in R).$$

or, since

$$\partial P_R/\partial p_{r'} = -(1/\lambda_R^2)(\partial\lambda_R/\partial p_{r'}) = (1/\lambda_R^2)(\lambda_R q_{r'}/m_R) = q_{r'}/Q_R,$$ [7]

and

$$\partial m_R/\partial m = Q_R + P_R(\partial Q_R/\partial P_R),$$

where $\partial Q_R/\partial P_R$ is the first-stage own-price slope; thus,

$$\partial q_r/\partial p_{r'} = (\partial q_r/\partial p_{r'})_{m_R} + (q_r q_{r'}/m_R)(1 + (\partial Q_R/\partial P_R)(P_R/Q_R)) \quad (r, r'\in R).$$

The matrix of corrective factors for all $r, r'\in R$ is symmetric and hence the matrix of two-stage cross-price slopes for all items in a same group is symmetric. Finally,

$$\partial q_r/\partial p_k = (q_r q_k/m_K)(\partial Q_R/\partial P_K)(P_K/Q_R) \qquad (r\in R,\ k\in K\neq R),$$

where $\partial Q_R/\partial P_K$ is the first-stage cross-price slope.

The consumption function, after aggregation of all future periods, is

$$C/P_c = C(P_{fc}/P_c, m/P_c, z/P_c).$$

If, further, present and future prices are in a fixed ratio (Hicks's theorem) we finally arrive at the classical formulation of the consumption function,

$$C/P_c = C(m/P_c, z/P_c).$$

In conclusion, group price indexes exist only if Hicks's theorem is assumed to hold or if separability into homogeneous group functions is postulated. Both assumptions seem untenable if a reasonably small number of groups is desired in terms of degrees of freedom. The model presented in this paper requires only local indexes that are obtained from much weaker requirements, and it is expected to provide a workable alternative to the above two.

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[7] In general, $\partial\lambda_r/\partial p_{r'} = -\lambda_R(\partial q_{r'}/\partial m_R) + (\partial\lambda_R/\partial m_R)q_{r'} = -\lambda_R(q_{r'}/m_R)$ under linear homogeneity.

As a partial illustration of the method, we present in Table 1 the corrective factors to be applied to the within-group own-price elasticities in Brandow's data [8]. Food is assumed to be additively separable from nonfood, with a money flexibility $\check{\omega}=-m/\theta=-0.86$. The group-expenditure elasticities are recorded in the first column, and the income elasticities in the second one, the corrective factor being $(\partial m_F/\partial m)(m/m_F)=0.25667$. Columns four, five, and six contain, respectively, the second-stage own-price elasticities, $(E_{rr})_{mF}$, the corrective factors,

$$w_r\left(\frac{\partial q_r}{\partial m_F}\,\frac{m_F}{q_r}\right)\left(\frac{m}{m_F}-\frac{\partial m_F}{\partial m}\,\frac{m}{m_F}\right)\left(1+\frac{1}{\check{\omega}}\,\frac{\partial q_r}{\partial m}\,\frac{m}{q_r}\right),$$

and the two-stage own-price elasticities, E_{rr}. The w_r's recorded in column three are the budget shares. The last column indicates the magnitude of the correction factors in percentage of the two-stage price elasticities. They range from zero to 20 percent and are small in general.

Table 1. Second-stage elasticities and corrective factors in Brandow's data

Commodities	$\frac{\partial q_r}{\partial m_F}\,\frac{m_F}{q_r}$	$\frac{\partial q_r}{\partial m}\,\frac{m}{q_r}$	w_r	$(E_{rr})_{mF}$	Corrective factor	E_{rr}	Corrective factor in percentage of elasticity
Beef	1.81	0.47	0.02834	−1.05	0.09572	−0.95	10.08
Veal	2.23	0.58	.00422	−1.61	0.01266	−1.60	0.79
Pork	1.23	0.32	.02194	−0.82	0.06975	−0.75	9.30
Lamb and mutton	2.50	0.65	.00180	−2.35	0.00453	−2.35	0.19
Chicken	1.42	0.37	.00919	−1.19	0.03067	−1.16	2.64
Turkey	1.88	0.49	.00229	−1.41	0.00765	−1.40	0.55
Fish	1.62	0.42	.00553	−0.67	0.01882	−0.65	2.90
Butter	1.27	0.33	.00396	−0.86	0.01274	−0.85	1.50
Shortening	0.46	0.12	.00251	−0.80	0.00410	−0.80	0.51
Margarine	0	0	.00158	−0.80	0	−0.80	0
Other edible oils	0.12	0.03	.00320	−0.46	0.00146	−0.46	0.32
Lard, direct	−0.19	−0.05	.00136	−0.40	−0.00114	−0.40	0.28
Eggs	0.62	0.16	.01128	−0.32	0.02322	−0.30	7.74
Fluid milk & cream	0.62	0.16	.02786	−0.35	0.07536	−0.29	19.28
Evaporated milk	0	0	.00172	−0.30	0	−0.30	0
Cheese	1.73	0.45	.00375	−0.71	0.01274	−0.70	1.82
Ice cream	1.35	0.35	.00590	−0.57	0.01938	−0.55	3.52
Fruits	1.54	0.40	.01839	−0.66	0.06230	−0.60	10.38
Vegetables	0.58	0.15	.02335	−0.35	0.04571	−0.30	15.24
Cereals	0	0	.01819	−0.15	0	−0.15	0
Sugar + sirups	0.69	0.18	.01649	−0.34	0.03711	−0.30	12.37
Beverages	0.88	0.23	.01031	−0.39	0.02747	−0.36	7.63
Potatoes	0.31	0.08	.00469	−0.21	0.00538	−0.20	2.69
Dry beans, peas	0.46	0.12	0.00392	−0.26	0.00640	−0.25	2.56

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Discussion: Quantitative Economics

James B. Hassler

In my judgment, the effectiveness of my role as a discussant can be increased by limiting my remarks directed at the contents of the two major papers and extending the coverage of issues in "Quantitative Economics" by a series of fundamental questions, opinions, and judgments. Obliquely, indirect evaluation of the main presentations will be apparent from my selection of concept and performance priorities.

Judge has presented an interesting historical review of accomplishments which have woven some logical consistency between the elements of economic theory and the operational arm of measurement techniques and theory. I wish that he had expanded the considerations contained in the sections "Preliminaries" and "The Search for Knowledge." One can legitimately question his rosy outlook (in terms of potential opportunity costs) contained in "The Road Ahead."

De Janvry and Bieri's paper is an example of one of the developments reported in Judge's review. It illustrates how conditional restrictions on an abstract economic theory structure, with implied two-stage optimizing simplification of parametric relationships, can permit estimation to proceed with data insufficient for less restrictive specification. It is a productive principle which should be applied wherever feasible in quantitative economics if the restrictive conditions do not reduce significantly the functional utility of the resulting output. Also, the operational usefulness of this more complete and sophisticated approach has to be tested in real decision processes against other simpler approximation methods.

Now let us make an unbiased evaluation of the observable performance in this field by means of my biased opinions. They are listed in no significant order:

1. An optimum amount of effort should be devoted to purely theoreti-

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James B. Hassler *is professor of agricultural economics at the University of Nebraska.*

cal work in the economic and measurement fields. This is the prime growth cell for later productive utilization in the real system. Personnel involved in these activities should not operate in a vacuous inner circle, writing for each other about methods and issues of doubtful usefulness or significance, and rarely wondering about problem priorities in the real world. Some involvement with people struggling with public or private problems would greatly enhance their comprehension.

2. Too many research workers (oriented theoretically or in applied activities) spend too much time trying to convince themselves and others that economics is a science and that they know how to use certain tools mechanically. Examples and theoretical structures are created not to be realistically useful but to satisfy the argument dimensions or technique requirements which they are espousing and to exhibit properties consistent with abstract theory.

3. We are either lacking in brain power or have conveniently shied away from the difficult task of specifying the necessary details for the relevant operational elements and relationship structures for real decision problems. Bluntly, measurement techniques and computational capacity are far ahead of our ability (or desire) to structure properly the economic model counterpart. When the decision process involves order and control for a multiple unit and level system, the operational model cannot omit the implementation threads. We are especially weak in form and time specifications for continuous dynamic systems and a proper conceptualization of motivational mechanisms for the human factor.

4. How much quantitative economic theory and measurement methodology is being used in public and private business? It would be interesting to have a comprehensive survey on this involvement. Undoubtedly, the use of statistical and programming techniques for information and control would be widespread. Large organizations would be continuously running simulations using questionable structural models on growth, reorganization, alternative environment conditions, and comparable issues. Much of this would be a fishing expedition, but should make management more aware of the interdependent adjustments built into the system.

5. Most research can be classified as either active or passive. We do too much passive research. Our expectations that information contained in quantified relationships will be used by businesses or public agencies is considerably exaggerated. Usually, we have failed to anticipate the specific information needs of the problem-plagued operators or the implementation requirements which we have omitted. Our best guidance on this practical problem is to place ourselves in the position of the decision-maker.

6. Finally, I would like to list a few priority objectives for econometricians to direct their analytic efforts toward.

a) Alternative structures and their implementation requirements for order and control of multidimensional systems. These alternatives (both theoretical and operational) should indicate a series of consistent operational procedures and organizational forms with more or less centralization of group and secondary decision authority. Goals and performance evaluations would be needed for choice purposes. Recognition of the dynamic aspects of the problem is essential.

b) Intensive investigation of motivational mechanisms for adjustment problems and for consumer behavior.

c) More diagnostic conditional research to delineate specific processes or decision points which cause performance measures for many interdependent functions to appear faulty. Solutions would be more specific and less global for such problems. Needed data or information development would be implicitly detected.

d) I repeat again—a more active and less passive research outlook.

CONTRIBUTED PAPERS: ALTERNATIVE APPROACHES TO RESEARCH

CHAIRMAN: T. W. MANNING, UNIVERSITY OF ALBERTA

Some Considerations Affecting Empirical Studies of Recreational Use[*]

W. E. JOHNSTON AND V. S. PANKEY

THE demand for recreational services provided by both the public and the private sectors has grown in recent years. Increases in leisure time and rising incomes foreseen for the future are likely to continue the need for expansion and development of recreational activities of many types. Recognition of these increased demands has led to research activity focused largely on the prediction of use of recreational facilities. In view of the considerable interest in empirical studies of recreational use and demand, some preliminary findings of one such study, in advance of a more formal and comprehensive report, may prove useful to others with projects in this area. The setting of the study is described first and then three major topics are briefly considered: (1) alternative formulations of the observation units, (2) assumptions about per capita use rates, and (3) the specification of distance in analytical models.

The Study

The data used were gathered by the Corps of Engineers staff for seven low-altitude, multiuse reservoirs in the central valley of California. The use survey identifies origin of recreators and the type of use in which they engage, that is, day use or camping. An objective is to determine factors influencing use (hence, factors useful to predict use) from among a potential group of independent variables that includes socioeconomic characteristics of the area of origin, reservoir characteristics, seasonal shifters, distance, density of the population in the area of origin, and one which reflects other recreational alternatives available to users from particular areas. The selected reservoirs are all accessible by surfaced roads and

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W. E. JOHNSTON *is associate professor of agricultural economics and associate agricultural economist in the experiment station and on the Giannini Foundation, University of California, Davis.* V. S. PANKEY, *presently in the U.S. Army, was postgraduate research agricultural economist, Department of Agricultural Economics, University of California, Davis.*

generally have boating, picnicking, and campsite facilities. They do, however, have a large degree of heterogeneity in location, size, and facilities, which may make the results applicable to sites with a wide range of physical characteristics.

Distance Zones vs. Subareas (Counties): Alternative Formulations of the Observation Units

Recent studies of recreational use generally have been built upon modifications of the "Clawson–Hotelling" model, which defines concentric zones about the recreational facility. Travel costs to the site, assumed equal from any point within a given zone, are taken to represent the price of the recreation experience for users from that zone. The number of people coming from the various zones and the costs associated with travel from each may then provide points to estimate a demand function. A recent modification of the basic approach has been the development of models not dependent on concentric zones about the site. Instead, subareas—in this case, counties—are defined and taken as the units for observations of use. This study, so far as we know, is the first to compare empirical results obtained by using concentric distance zones with those obtained by using subareas (counties) as observation units.

For the distance-zone formulation, 14 distance zones were defined for each reservoir. The first five zones consisted of 10 road-mile increments up to 50 miles and the next eight consisted of 25 road-mile increments up to 250 miles. Because the last zone was open ended (250 miles and farther), it is not included in the statistical analysis.

The primary advantage of the distance zone is that the observation unit can be made any desired size. Since distance is probably the next most important variable after population in predicting use, this may be a relevant consideration. However, the benefit derived must be sufficient to offset the costliness of zone definition and allocation of data to the zones for subsequent analysis. For example, the allocation of population estimates to distance zones is difficult and perhaps subject to error. The population of each zone was estimated, using Census County Divisions (CCD) from the 1960 Census of Population, but CCD boundaries seldom coincide with zone boundaries. For a CCD wholly within a zone, the population of the CCD was assigned to that zone. For a CCD not wholly within a zone, a proportion of the population, based on the area of the CCD within the zone and on the distribution of population in the CCD, was allocated to that zone. Populations of these CCD's and parts of CCD's were summed to give the estimate of population within each zone.

Other variables of potential interest may be rendered sterile when allo-

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cated to distance zones from census or other sources of data. For example, parts of the same zone may include many heterogenous areas, resulting in "washing out" differences in socioeconomic characteristics. That is, the north half of the zone or "doughnut" may be greatly different from the south half when distances between the two become great. As an illustration, parts of distance zone 13, which is the zone encircling the site with a radius of 225 to 250 miles, are removed from each other by as much as 500 miles.

The determination of distance zones is a costly and somewhat arbitrary process. Socioeconomic characteristics, including population, are much more easily defined when the county is used as the observation unit, since many data are available at the county level. An equally important consideration relates to the determination of the area of origin of the user. Recreationists are likely to know the county within which they reside, but it may be difficult to identify precisely the zone within which they live. This potential bias can be overcome by using the county as the observation unit. Further, the use of counties permits the definition of density and alternative variables which were found to be statistically significant in the analyses discussed below.

Table 1 shows the results of comparative analyses using data for spring, summer, and fall seasons of 1966 and the spring and summer of 1967. All equations use the natural logarithmic form of the dependent variable—total use, day use, or overnight use. Both linear and logarithmic forms of independent variables are examined for their importance in explaining variation in the dependent variable. Although a large number of potential independent variables were considered initially, preliminary analyses demonstrated that population was the only generally significant socioeconomic variable and that land and water surface area, as well as the variation in water level, were important reservoir characteristics. Dummy (zero-one) variables were introduced to represent seasonal shifters from the base (spring season) and to account for the uniqueness of Isabella Reservoir. Isabella is the southernmost reservoir (and, therefore, closest to the population mass in Los Angeles) and has twice as many developed campsites as the remaining six reservoirs combined, a fact which may explain, in part, the statistically significant difference between it and other sites included in the analyses.

Per Capita Use

The analyses cast doubt on the "reasonableness" of utilizing per capita use as the dependent variable in analyses of recreational use. The check on reasonableness was to let population enter as an independent variable in its logarithmic form and then to test whether the regression coefficient was statistically different from unity. The tentative conclusion is that the

Table 1. Results of multiple regression analysis of recreational use, of observation[a]

Item	Number of observations[b]	R^2	Constant	ln Population[c]	Reservoir characteristics			ln Density[d]
					Land area	ln Land area	ln Water surface area	
A. Distance zone	(455)							
A.1 ln total use	385	0.658	− 3.414	1.099 (18.5)		0.6722 (6.0)		N.A.
A.2 ln day use	372	0.685	− 2.935	1.061 (18.8)		0.6508 (6.3)		N.A.
A.3 ln overnight use	181	0.661	− 6.315	0.920 (11.3)		0.4865 (2.7)		N.A.
B. County	(2,030)							
B.1 ln total use	556	0.704	−14.180	0.9095 (15.4)		0.8903 (8.9)		−0.2335 (5.3)
B.2 ln day use	484	0.720	− 9.205	0.9817 (17.4)	$2.032 \cdot 10^{-}$ (11.9)			−0.2931 (6.9)
B.3 ln overnight use	258	0.619	− 5.004	0.7786 (9.7)			0.6099 (6.2)	−0.1569 (2.4)

[a] All equations based on data for spring, summer, and fall seasons, 1966, and spring and summer, 1967. The t-ratios for the null hypothesis, $\beta_i = 0$, are given in parentheses below parameter estimates.

[b] Number in parentheses indicates the possible number of observations, whereas other entries indicate number of nonzero observations available for each analysis.

[c] Population residing in the distance zone or county, 1960.

[d] Number of people per square mile in the county.

consideration of per capita use as a dependent variable may not be correct when analyzing subaggregate use, since the coefficient on the population variable did differ significantly from unity in the equations explaining overnight use. As sophistication in analyses of recreational use progresses to include other subaggregates of total use (that is, individual activities like fishing, water-skiing, and boating), it may be erroneous to assume that per capita use remains constant with increases in population. Interpreted with the negative relationship found for the density variable, a coefficient for the population variable which differs significantly from unity may indicate, for example, that increased population in urban areas cannot be expected to increase proportionately all types of recreational activity.

Distance

The usual practice has been to make an *a priori* assumption about the specification of the distance variable which is used as a proxy for travel cost (price) in demand models of recreational use. By using a stepwise regression procedure, a wide variety of potential and alternative specifications of the distance variable were admitted into the analysis, includ-

seven selected reservoirs in California, distance zone and county units

ln Alternatives[e]	Dummy variables[f]			Distance variables[g]				
	Summer	Fall	Isabella Reservoir	$D^{1/2}$	D^2	D^3	$D^{-1/2}$	D^{-3}
N.A.	0.5868 (4.6)	−1.014 (6.4)	1.610 (8.1)	−0.9766 (18.6)	$5.584 \cdot 10^{-5}$ (7.8)			
N.A.	0.4556 (3.9)	−1.036 (7.0)	1.239 (6.5)	−0.9303 (22.1)		$2.401 \cdot 10^{-7}$ (8.7)		
N.A.	0.7191 (3.9)	−1.029 (4.1)	2.628 (10.2)	−0.3285 (8.2)				
−0.1769 (4.0)	0.5518 (5.4)	−0.6733 (4.7)	1.018 (6.2)				43.90 (27.4)	−7029 (5.6)
	0.5084 (4.9)	−0.6593 (4.5)					43.17 (26.9)	−6107 (5.1)
−0.1333 (2.1)	1.0720 (7.7)		1.522 (7.6)	−0.1983 (11.4)				

[e] $\Sigma_{i=1}^{N} A_i/D_i^{1/2}$, where N is the number of alternative water recreation areas used by the population of the county,
A_i is water area of alternative i, and
D_i is distance from county population centroid to the alternative.

[f] Zero-one shifters.

[g] Road miles from reservoir to midpoint of distance zone or to county population centroid.

ing linear distance (D), D^2, $D^{1/2}$, D^3, $D^{3/2}$, D^{-1}, D^{-2}, D^{-3}, $D^{-1/2}$, $D^{-3/2}$, and ln D. The underlying hypothesis was that distance is likely to affect day use differently than overnight use. The concern was verified by empirical results which indicated that specifications of distance for particular types of use do differ (see Table 1). As a consequence, more precision in estimating total use apparently can be gained by predicting subaggregate use (day, overnight) and using the sum as the prediction of total use. Further, the specification was also found to be different between models based on distance zones and those using county data.

Summary

The feasibility of using county data in recreational use analyses is appealing because it is relatively easy to assemble information about variables necessary for the analysis, because it permits the specification of additional variables such as density and recreation alternatives, both of which were found to be significant in explaining use, and because the explanatory powers of models using county data was found to be generally superior to that of models using distance zones. The fact that California counties vary greatly in size may indicate that the county will be an even better observation unit for analyses in areas which have smaller counties and less variability in county size. The use of smaller subareas may permit the statistically significant introduction of other potential socioeconomic variables whose effects may even be washed out in analyses based on large subareas. The usual assumptions about constant per capita use adopted for many planning purposes may not be appropriate for analyses of all types of recreational activity. Additional research can give further insight into these problems as well as into the problem of correctly specifying distance in models of recreation use.

A Systems Approach to Planning Long-Range Marketing Programs

ARLO J. MINDEN

THIS discussion centers on structuring an information system to provide guidelines for long-range planning of marketing activities in firms supplying inputs to agriculture. The information system is really a subsystem, since it is concerned with providing guidelines only for marketing decisions and not for all the operating functions of the firm. The discussion is intentionally general in terms of firm or industry reference to allow the reader to draw on situations from a particular firm or industry to test the logic of the conceptualized system.

The Problem

The problem is to structure an information system to assist in planning a firm's marketing activities. The system provides answers to questions such as how changes in market structure can be predicted and what adjustments should be made in the existing marketing program to accommodate corporate performance objectives. Major components of the information system must coincide with and provide data needed to establish new or reaffirm existing marketing objectives.

The System

The proposed information subsystem is basically a simulation model constructed to depict the market facing the supply firm. There are two main components in the system (simulation model) in Figure 1. They are the consuming component (demand) and the supplying component (supply). The supply component includes the local and intermediate units in the marketing organization as well as the parent firm supplying a particular input. The firm's competitors, individually at various levels of the market and collectively as the industry supplying the particular input, are also included. Performance of alternative marketing organizational forms and activities suggested by the service gap defined by the demand and supply components is evaluated in the corporate performance component.

The Components

Each component of the system is discussed in terms of (1) information needs, (2) sources of information, (3) procedures for developing data and information not available, and (4) its relationship to other components of the system.

ARLO J. MINDEN *is assistant professor of agricultural economics at Purdue University.*

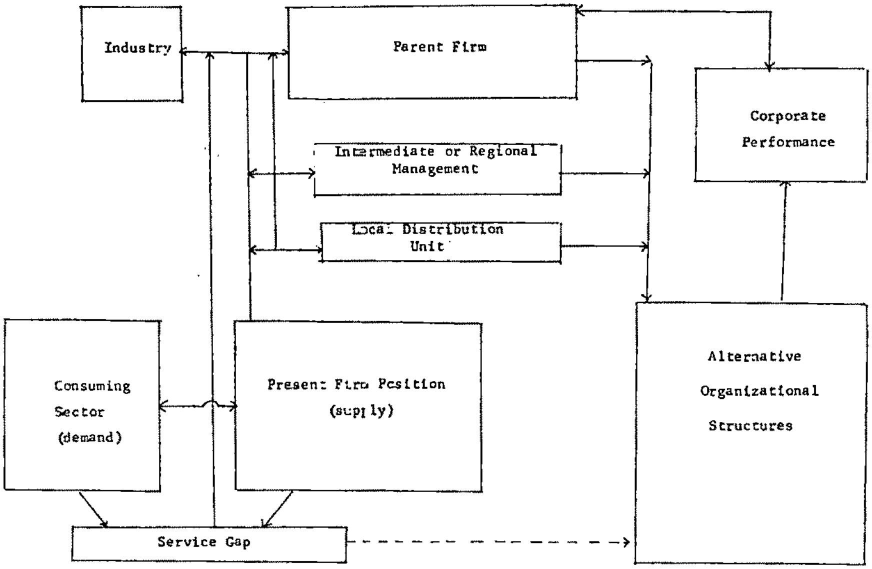
Industry
Parent Firm
Corporate Performance
Intermediate or Regional Management
Local Distribution Unit
Consuming Sector (demand)
Present Firm Position (supply)
Alternative Organizational Structures
Service Gap

Figure 1. Schematic of an information system for use in planning organization of marketing activities

Demand

The demand component provides the basis for evaluating present marketing activites. Alternative marketing organizations and activities are based on the characteristics of demand as specified by this component. Information in this component reflects who purchasers are presently and will be in the future and the behavioral characteristics of purchasers. Specific data reflecting type and quantity of physical products and/or services demanded are also generated.

Traditional sources of information relating to farmers' purchasing patterns are governmental agencies and colleges and universities, industry associations, private market information groups, and the firms themselves. The results of studies by these groups provide some understanding of past market conditions and a basis for projecting trends in aggregate demand for agricultural inputs. However, most data currently available relate to quantities and prices of physical products and not to behavioral motivation of farmers.

Psychological and sociological studies of purchase behavior may provide guidelines for estimating potential effective demand, especially if the results of these studies are incorporated into decision models relating to the growth of farm firms. Recent studies of farm growth have been designed to analyze the decision criteria and process of farmers with respect to consumption, investment, and purchase of services.

Demand relationships for selected inputs for various types of farmers may be estimated and projected for national, regional, state, and local market areas. These estimates may be derived by using secondary and primary data and various formal estimating techniques. Demand relationships for geographic areas may be contrasted to determine differences in responsiveness of prices and quantities to certain other factors. Preliminary behavioral information may be obtained by sampling the attitudes of purchasers.

The discussion of the demand component has been oriented primarily toward the traditional concept of the farmer as the agricultural producing unit. Increased activity of nonfarm corporations in agricultural production activities suggests that major changes in purchasing patterns for certain inputs are probable. The same information is needed for vertically and/or horizontally integrated producing units as for the traditional unit. Failure to recognize who purchases certain types of inputs may result in a serious underestimation of the influence of the individual purchaser in local market areas.

The demand component of the system influences the supply component. In addition, the supply of technical information may stimulate a demand not otherwise evident. In industries with little real product differentiation, the supply of technical information may be the factor to be manipulated to maintain or expand the firm's market share. The concern for predicting future demand for physical products should not overshadow estimation of the demand for the associated technical information.[1]

Supply

The first step in developing the supply component is to determine the information necessary for the decision process. The information presently used by marketing management personnel may not adequately reflect information needs. University personnel and others may also offer useful guides for determining needed information. Information in the supply area must reflect the present position of the parent firm at each level of operation in the market and its relation to competitors. The capacity of each level of the marketing organization to satisfy present marketing objectives and present and future consumer demand must be specified.

Information needs for the supply component are likely to include complete specification of (1) the firm's marketing policies and objectives, (2) its marketing organization and activities, and (3) the activities of its competitors. Data specifying decision centers and accountability points are essential. Cost of services must be separated from product prices. Discounts and other special concessions and selling practices and philosophies influencing market performance must be identified. Guidelines are needed for estimating competitors' reactions to certain actions by the parent firm.

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[1] It is appropriate to reiterate at this point that this paper is an expository discussion of a conceptual system and does not attempt specifically to develop the justification for any particular methodology. However, techniques are available which will, if properly combined, facilitate operation of the system proposed here.

The service gap

A service gap is defined by comparing the characteristics of projected demand with the capacity and flexibility of the existing marketing organization. This gap must be filled if the firm is to maintain or improve its market position.

Little data and fewer analytical results are available to aid in evaluating marketing programs, defining the service gap, and developing alternative marketing organizations and activities. One procedure for generating this information combines information about cost relationships for supplying firms with information about demands for inputs, into a model which simulates both aggregate market environments and operations of firms within the market.[2] The simulation model is first used for experimental gaming in which managers of firms supplying agricultural inputs make marketing decisions in an environment approximating actual business situations. Decisions involve product and service pricing, procurement, product mix policy, labor, promotion, investment in facilities, marketing policy, and acquisition of capital. The behavior of managers in response to stimuli provided by other managers acting as competitors is observed. Variations in behavior under different conditions are analyzed and compared with responses to similar conditions in real life.

Results from the experimental gaming phase become input information for further experimentation. Behavior of managers under specified conditions is established as policy for subsequent applications of the simulation model to determine market and firm performance for such policies. Consequences of performance are identified at different points in time and the consequences of selected policies and environmental factors are assessed.

Alternative organizational forms

Information from the demand component plus that generated for the supply component defines the service gap. This gap plus projections and assumptions about the economic environment provides the basis for developing alternative marketing organizations, programs, and strategies. These organizational forms may be direct derivatives of the existing organization or they may include completely new organizational concepts.

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[2] Similar systems may have been developed for firms in other industries.

Formulation of realistic alternative organizations, programs, and activities should emphasize the determination of what combinations of products and associated services firms will need to offer to satisfy demand while remaining an efficient and viable economic unit.

Performance of alternative marketing plans can be evaluated before actual implementation by incorporating various decision parameters of the plans and other data into the planning-oriented information system.

New Approaches Needed in Applied Meat-Animal Research

EDWARD UVACEK, JR.

A RECENT paper by James D. Shaffer, directed toward publicly supported economic research, emphasizes the need for problem-oriented research by public institutions. It is argued that the agricultural economics profession has impaired its capacity to deal with such problems because of overspecialization [3, p. iii]. This criticism, however, is not limited to agricultural economists but is applicable to practically all scientists, both social and physical, that have dealt with agricultural products.

In no agricultural commodity has the lack of a broad, all-encompassing approach been more apparent than in meats research. Seldom, if ever, is even an attempt made to coordinate the entire livestock and meat industry by resolving the differences between the two extremes of the system—the producer and the consumer. Yet it is within this general overall framework that the answers lie.

Livestock production and meat marketing have long been a fruitful area for research by animal scientists. The complexity of the system lent itself to a wide array of specialization, from physiology of reproduction through nutrition, genetics, management, meat technology, and even human nutrition as it related to meat. Sizable funds were put into research dealing with livestock production.

In more recent years, the agricultural economics departments at most of the major universities have allocated substantial resources to the economics of livestock production and marketing. Efforts were devoted to studies of the efficiency of livestock marketing agencies, costs and margins work, farm management and resource utilization, livestock and meat outlook, consumer preferences and acceptability studies, descriptive literature on market structure and performance, cost on ranches and in feeding operations, and overall interregional competition studies.

Some important technical production contributions to the livestock and meat industry have continued to reinforce the popularity of the production scientist. By contrast, the findings of the agricultural economists are still not fully accepted by the industry. A major cause of this lack of acceptance may lie in the piecemeal approach to the problem taken by most agricultural economists, which yields results that are unrealistic in relation to the firm's decision-making processes. In the case of the production scientist, this was tolerated, but for the economist, it only postpones the final solution by failing to recognize the real elements of the problems.

EDWARD UVACEK, JR., *is associate professor of agricultural economics at Texas A&M University.*

The agricultural economist has traditionally examined only segments of this complex industry and has thus viewed each level or firm within the livestock and meat business as having the same goal—profit maximization. Although this predetermined goal is generally applicable to most firms within the industry, it is not entirely sufficient for explaining decisions at all levels, particularly those made by the producer and the consumer. In these ultimate segments of the industry, we find signs of many objectives completely incompatible with profit orientation.

An analysis of cattle production by Uvacek and Schmedemann, for example, indicates that there might well exist within the livestock industry today a large proportion of cattlemen who might be called "contemporary ranchers" [4, pp. 12–14]. Such individuals often seek indirect economic returns and even noneconomic rewards for engaging in the livestock business. Goals of such cattlemen might be tangible revenue sources such as price appreciation on the land, income tax benefits, or less concrete rewards in the form of outdoor recreation. Still others, however, gain great satisfaction through the esthetic value of being a cattleman or landowner, enjoy the privacy and contemplation of living on a ranch, and have other similarly less measurable values and returns. A recent *Journal* article, dealing with the effects of federal income taxes on cattle-ranch prices, indicated that 73 percent of the new owners of Arizona ranches purchased their ranches for intended tax shelters or acquired more than 50 percent of their income from nonranch sources [2, p. 43].

The relatively low returns in the cattle business obviously fail to explain the fantastic 41-percent growth of the industry in the last 20 years. Similarly, the reasonable profit potentials in the sheep industry do not provide explanations of the 35-percent decline in that industry during the same period. If, in fact, the production of cattle is largely determined by firms and persons not very much concerned with the profitability of the livestock business, then a re-evaluation must be made of research and extension programs in this field, many of which implicitly assume a profit-maximizing goal.

On the other end of the system, the ultimate reasons behind certain meat purchases by consumers are often noneconomic in nature. For example, a Louisiana study pointed out that certain cuts and types of meats have a status or prestige factor. Results show that steak ranked high as a meat selection when serving an important man guest, but that chicken was the first choice if the guest was a woman. Meat, therefore, may be chosen for the prestige it will give the consumer who serves it, and price may become an almost insignificant consideration [6, pp. 13–41]. The influence of the homemaker's education, the amount of time available for cooking, and race of the family also have tremendous effects upon the purchasing decisions of consumers [6, pp. 15–19].

At Texas A&M University, a panel discussion during an industry-wide meeting emphasized that most housewives are basically concerned with the tenderness, flavorfulness, and reliability in terms of performance of a cut of meat and have little interest in becoming acquainted with meat cut terminology or a justification of the cost [1]. In a preliminary report of the National Livestock and Meat Board and the U. S. Department of Agriculture, homemakers indicated that meat selection was greatly affected by the quality, flavor, amount of waste, and healthfulness, but was influenced also by such factors as weather conditions, convenience of preparation, and even the eating idiosyncrasies of house guests [5, pp. 17–26].

Consumer preference and acceptability studies continue to be quite revealing but provide only limited information until we can determine also (*a*) the retailers' preferences or what is actually offered to the consumer, (*b*) the underlying reasons influencing the consumer's choice, and (*c*) the required degree of services demanded in meat purchases. It is obvious that price or quality differentiation among meats does not hold the entire key to the problems of meat selection. Even the influence of advertising and promotion, and their psychological effects upon meat purchases, must be included in any analysis and some method of evaluation developed. As economists, we cannot continue merely to combine all these unmeasurable factors into our usual ambiguous phrase—"a change in tastes and preferences."

Consumer likes and dislikes or, more important, their final choices of meats are the key to meat industry demands and thus to livestock production needs. Can we continue to deal with these two extremes as separate entities, allowing only a casual relationship, by disregarding the ultimate goals and desires of each? Compounding the complexities of the system are either producer- or consumer-oriented governmental programs such as the Packers and Stockyards Act, School Lunch and similar purchase arrangements, and Meat Inspection Services. More recently, the total impact of futures trading and synthetic meat substitutes has raised some isolated cases of interest. Efforts, however, continue to be directed toward minute portions of the industry, with primary emphasis upon descriptions of the system. We are caught in the trap of describing the elephant while he disappears into the river.

Could it be that the economist's easily accepted "profit-making" or "utility-maximizing" objectives have provided him with an excuse for not even considering other psychological and sociological factors involved in the industry? Just as it becomes impossible to speak in terms of direct profit-making goals when doing a production analysis of the operation of a hobby breeder or a doctor's weekend ranching enterprise, so too do we arrive at only partial answers, and even sometimes conflicting solutions, when we literally interpolate consumer preference, acceptability, or home economics research results.

The sociological, psychological, and other noneconomic influences in the meat business have been too long ignored. In many cases, we have learned what has happened, but we frequently fail to ask why it happened. There are many facets of the meat marketing picture which cannot be explained by traditional economic theory. This does not imply that the analytical framework used in the past was incorrect, but rather that it requires other inputs for correct solutions. Our scope of attacking these problems must be broadened to research team approaches, utilizing sociology, psychology, industrial management, home economics, and business administration, as well as the various specialties within the fields of agricultural economics and animal science. Some of these other disciplines are required for any carefully planned economic analysis.

Within industry, the reponsibility for such team approaches to problems is often assumed by the lawyers. In fact, in some corporations the legal department controls the entire area of marketing. In the academic world, however, the responsibility for team efforts may fall, by default, upon the shoulders of the agricultural economist. The sociologists, although their contributions to the team would be a necessity, have devoted so much of their energies to rural living problems that the urban consumer, the principal user of agricultural products, has received little concentrated effort. Their leadership in attacking the entire industry concept is, therefore, highly improbable. Most animal scientists have been content with the limited economic contributions provided thus far, and from their standpoint there seems to be little incentive to require any more massive doses of economics. This is especially true because some new concepts, such as increased economic gains through limited feeding, lighter weight calves, or alterations in breeding programs, might prove incompatible with commonly accepted production techniques.

It therefore becomes the responsibility of the agricultural economist to alter the present approach to problem-solving by initiating changes in procedures to incorporate the team idea into research projects. As emphasized by Shaffer, creative and productive research does not merely result from independent efforts, or as he calls it "anti-anti-coordination" [3, p. 19]. In contrast, an interdisciplinary approach is now a required technique of we are to be productive in solving problems for the livestock and meat industry. It is also an immediate demand and one that must be satisfied either by the economist or by other professionals. The livestock and meat industry, as one of the few remaining agricultural commodities operating in a free market economy, deserves this new, broader consideration of its expanding problems.

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Computer Simulation as a Planning Tool in Developing Economies*

M. L. HAYENGA, T. J. MANETSCH, AND A. N. HALTER

COMPUTER simulation is a systems analysis tool which utilizes subject matter theory, certain mathematical structures, programming logic, and empirical analyses to condense a complex system into a mathematical formulation duplicating the essence of the real system. Thus, it focuses on the whole system of interrelationships within the selected universe of inquiry. Recently, computer simulation has begun to be explored as an economic development-planning and decision-making tool which can simultaneously incorporate multiple objective or criterion functions and uncertainty in analyzing the results of various policy combinations over the course of time. An interdisciplinary research team (primarily agricultural economists and systems scientists at Michigan State University) is currently simulating major elements of the Nigerian agricultural economy. Our current efforts [4] and review of some of the previous literature [1, 2, 3] prompt us to evaluate simulation tentatively as a planning and policy-making tool at the macro level, especially in developing economies. The following discussion will focus on the capabilities of an economy simulation model and the resources required to develop it.

Basic Building Blocks

The basic building blocks of a simulation model are the physical, biological, economic, and socio-cultural relationships existing within and between the major sectors of the economy. If great complexity and accuracy are desired in the model, a substantial research investment may be necessary to design and build a satisfactory simulator incorporating realistic mathematical descriptions of current and potential production, consumption, and marketing behavioral relationships within the economy. Simulation can incorporate many types of functional relationships—including dynamic interactions, curvilinearities, discontinuities, time lags, probabilities, and irreversibilities—into the model to reflect closely the current or potential real system. The chief constraint appears to be the ability of researchers and policy-makers to specify accurately the appropriate functional relationships within the system.

A simplified simulation model could utilize primarily that information

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M. L. HAYENGA *is assistant professor of agricultural economics,* T. J. MANETSCH *is associate professor of systems science, and* A. N. HALTER *is visiting professor of agricultural economics, all at Michigan State University.*

about the functional relationships which the decision-maker currently uses or assumes. These relationships could be transformed into integral quantitative elements of a computer simulation model which would be readily available to the policy-maker for quick objective estimates of the dynamic impacts of multiple policy alternatives under conditions specified in the model. However, simulation models do require, at the least, some minimum "critical mass" of information. Otherwise, the specified relationships may not include crucial variables or data which may, by their omission from the model, lead to highly misleading evaluations of policy alternatives.

Simulation Capabilities

While many quantitative planning tools require a single objective or criterion function to be specified, simulation has the advantage of allowing several benefit and cost dimensions to be simultaneously considered (but not maximized). Such planning criteria as farm gross income, personal incomes (and their distribution), marketing costs, tax revenues, government expenditures, asset values, nutritional levels of the population, foreign trade, and exchange balances can all be considered for each year or accumulated (at the appropriate discount rate) throughout the relevant planning period. Thus, a weighting or priority system among policy criteria need not be specified for the model; the actual policy-maker can allocate priorities among the benefit, cost, and time dimensions according to the preferred incidence of the policy consequences to groups or sectors in the economy, and the relative preference for short- or long-run benefits or costs. Several agencies planning along varying time horizons or using different criteria can use the same simulation model. Alternatively, individual sectors within simulation models can be simplified or developed in more depth where required by the changing needs of policy-makers. In systems or subsystems where a single benefit–cost comparison is deemed most appropriate, mathematical optimization techniques can be incorporated into the model to provide optimum decisions for certain elements within the economy. Further, potential dynamic policy results under various hypotheses (that is, some defined best, average, or worst possible condition) can be used to give the policy-maker a clear picture of the range of possible results and some feeling for their likelihood.

The process of formulating the simulation model may be beneficial itself to planning and policy-making, since those planning officials involved in the model development process are forced (*a*) to specify carefully their usual assumptions and data sources, (*b*) to examine the relevance and accuracy of these assumptions and data, (*c*) to study comprehensively and specify the underlying interrelationships (which might be neglected in ad hoc policy-making situations), and (*d*) to specify the impact of each policy upon the model structure and parameters. Thus, the planners may refine and improve their decision process and the information used in it. Decision-making and modeling efficiency can also be enhanced by first noting irrelevant data and functional relationships, then avoiding them in future modeling and decision-making processes.

Once the simulation model has been developed, it can provide a low-cost, quick means to experiment with and analyze comprehensively the complex relationships affecting the results of various policy alternatives. In this way, poor policies can be dropped before they are implemented. The process of simulation model development and experimentation can stimulate greater insight of both researchers and planners into the mechanisms and likely patterns of change within the economy. Further, the decision-maker can be introduced as an actor directly into the experimental system to make exogenous policy decisions at the end of each time period, allowing immediate feedback on the results of alternative decision patterns and policy choices. Thus, the individual's planning capacity can be enhanced by using a simulation model as a participating education tool.

General model experimentation and sensitivity analyses on particular data or structural components of the model can be very useful in diagnosing development bottlenecks within the economy. This may stimulate the creation of new policy approaches which may be particularly suited to alleviate or eliminate these economic growth constraints. In addition, sensitivity analyses suggest where errors in the model components could have substantial impact on model results. Large criterion function shifts resulting from small changes in model components can suggest that high priority be given to acquiring correct specification of those components to insure model realism. These large shifts further suggest that substantial payoff from developmental research would result if that change in the input–output relationship could be implemented in the real world. This resulting identification of potential high-priority research areas can lead to more productive and efficient allocation of research efforts in developing economies.

Resource Requirements

Computer simulation is a quantitative planning and decision-making tool which provides substantial capability for quick, comprehensive policy analyses and problem diagnosis. Thus, it can be very useful in training and educating planners and policy-makers and improving communication between them. However, substantial information reservoirs and research investments are usually necessary to develop a reasonably complex and useful simulation model for regional or national development planning. Since the credibility and usefulness of the model depend heavily on the realism of its structure and predictions, developing the model components is a very critical element of the simulation process. A large computer able to manipulate the mathematical relationships (and the language) of the simulation model must also be accessible. Further, trained personnel must be available to update continually the functional relationships within the model, to specify the impact of new policies upon the model structure and parameters, and to interpret the results of model experimentation for the decision-maker.

The most limiting resources in simulating developing economies appear to be (1) trained personnel and (2) the amount and breadth of applicable descriptive information available about the interrelationships within the economy. Trained personnel often are not available but usually can be trained during the modeling process and initial implementation efforts. Since this training effort usually affects positively the receptivity of planning agencies to this "new" planning tool and the resulting demand for and usefulness of the simulation model, training personnel is an important requisite for simulation to be an effective planning tool.

Often much descriptive information about the economy is directly available and appropriate for fitting the desired functional interrelationships in the simulation model. Much of the remaining necessary information often can be approximated from previous research related to that desired. If additional information is required, it must be acquired through costly primary data collection and analysis or less costly informed "guesstimates" by experts, or simply by choosing some arbitrary values and testing whether the model is sensitive to changes in those values. If the simulated results are sensitive to the model element in question, the benefits of increased model realism must be compared with the cost of data acquisition to decide the appropriate course of action.

Conclusions

In many underdeveloped countries, the benefits possible from the research and modeling effort and the additional likely benefits from using a simulation model as a planning and policy-making tool indicate that the resource investment in a simulation model probably would be worthwhile. When comprehensive simulation models are developed for a few economies, the cost of developing simulation models for additional economies should be reduced. The basic model components can be transferred (with limited programming modifications to account for any peculiarities of the economy) and the functional relationships can be revised to reflect the relationships in the economic system to be simulated. This potential reduction in the cost of simulating additional economies should enhance the future demand for this useful quantitative planning tool.

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FIRST AWARD PAPER IN THE UNDERGRADUATE STUDENT ESSAY CONTEST

Theory of Hedging on the Beef Futures Market

CLAUDE L. JONES

AS THE beef industry of the United States continues its increasing specialization, the problem of price variability becomes an increasing menace to the financial well-being of the beef producer. Of the total number of cattle on feed marketed today, 50 percent come from feedlots capable of handling over a thousand head each. Total capital investment in each of these organizations is in the order of one million dollars [3, p. 15]. Let us assume that a beef feeder has 1000 head of 1100-pound steers and that the market price drops 25 cents per hundredweight. Simple arithmetic shows that he has lost $2750. This example illustrates to a great extent the importance of price variation to the cattle feeder.

The risks of price variability can be somewhat reduced. A study of methods of insuring against price variation is interesting, profitable, and worthwhile. Hedging on the newly formed beef futures market is one means of obtaining this insurance.

Definition of Terms

At this time let us define the term *hedging* as it will be used in this paper. *Hedging* will be defined as holding x_i units of spot market i and x_j units of future market j such that the price risk of holding x_i and x_j from time t_1 to t_2 is minimized [5, p. 142]. *Spot* is defined to be cash market holdings. *Basis* is the term used for the difference between the spot and futures price.

Relevance of Economic Theory to Beef Hedging

The major purpose of this paper is to show the relevance of economic theory in explaining hedging in the beef cattle industry. Two theories of why hedging is done will be investigated and explained.

Economic Analysis of Hedging

Most students in economics can describe why the firm should operate at the point where marginal cost equals marginal returns in quite some detail with the use of sophisticated mathematical tools such as calculus, indifference curve analysis, etc. But how is it possible to describe the simple act of hedging a commodity with the direct use of economic principles—or can

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CLAUDE L. JONES *is a senior in agricultural science at the University of Illinois.*

this even be done? The answer, as one might expect, is that the process of hedging can be explained with the use of purely economic concepts. Keynes, Hicks, Working, and others have attempted to do this.

The Keynes–Hicks Theory of Hedging

If we assume a situation which we will call "normal conditions" where supply and demand remain unchanged, Keynes hypothesized that the futures price for one month's delivery would tend to be below the spot price now ruling. This difference in price which we normally consider to be basis was called "normal backwardation" by Keynes. He considered this difference to be the amount the hedger had to give to the speculator as compensation for the risk assumed by the speculator [4, p. 138]. Hicks asserts then that the uncertainty of the future and the desire to keep one's hands free to meet uncertainty are the main factors that limit the extent of forward contracting [4, p. 139].

Risk aversion is the main theme here. Arthur [1, p. 220] suggests that under this philosophy people who are hedging are trying to shift risk and are indifferent to the general price level so long as the basis embraces a price relationship which will not worsen for the traders during the life of the contract. Through the use of the hedge, a manager can divest himself of the price risk and deal in the area of risk in which he is most competent—quality considerations in the market area, location of plant, etc. The fact that he makes money on the narrowing of the basis on today's futures contracts is because he has insulated himself from the effects of price change and has been awarded a profit by assuming the risks he feels he can most efficiently administer. Arthur goes on to say, "It [the futures market] may be defended in considerable part that the futures market enables businessmen performing the necessary functions of supplying economic needs and allocating economic resources to make their money decisions more efficiently and with assurance that they are operating farther over toward the 'certainty area' . . . than would otherwise be the case without the futures market" [1, p. 216].

Arthur uses a diagram such as Figure 1 to show that the use of the hedge removes the price risk involved in holding an inventory of cattle. By eliminating the price variation, the manager is able to deal with the risks involved in feeding and management which are farther toward the certainty end of the spectrum. The producer, therefore, can avoid the negative return elements by using sound policies. The producer then theoretically should be able to collect his normal returns of the operation by using the hedge; that is, any gain (loss) in spot is offset by a loss (gain) in futures as is represented by the shaded bar. Without the use of hedging, more uncertainty is encountered (as represented by the left-hand portion of the graph) and a situation with possibilities of both positive and negative returns beyond

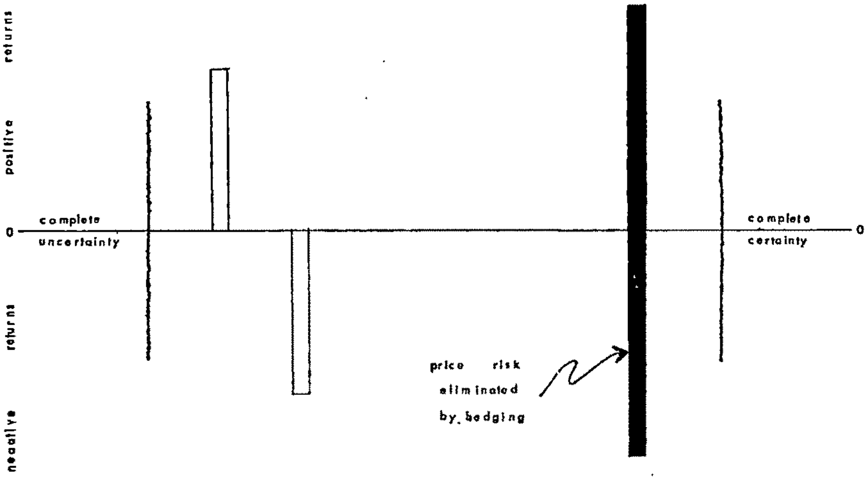

Figure 1. Effect of hedging on certainty and normal returns

what has been expected exists (normal returns to the operator would be some point on the horizontal axis).

The Working Theory of Hedging

Working [8] says that the Keynes–Hicks theory of hedging is not always representative of the hedger's actions. The futures market was developed as a contribution to efficiency. He asserts that hedging is not always insurance (a means whereby risk is shifted for a premium), but that the hedging process is really used only when there is expectation of change in the spot–futures relationship (wider basis existing at time of hedge than ordinarily occurs, for example). Furthermore, even though the hedge is usually considered a risk aversion measure, it is not logical to assume a hedge will be made when the current market price is low in relation to the generally accepted average. The hedge would logically be made only when the price is high in relation to expectations.

Stein [7] has attempted to put the above stated theory into some workable mathematical expression. In doing this, he first assumes a condition of pure competition, and then states that an "owner of stocks will allocate his stocks between hedged and unhedged holdings to maximize his expected utility." Let q equal current price of futures contract and q^* equal price of futures contract at a later date. Then he proposes that the expected gain from holding hedge stock will be $h=(p^*-p)-(q^*-q)-m$, where p^* is the spot price at the later date, and p the spot price today minus the net carrying charges, m, which consist of the marginal costs of storage and the marginal convenience yield which is a measure of the advantage of having stock on hand (a negative element in the carrying charges). Continuing his analysis, let u equal the expected gain from the holding of unhedged stock. Then hedging may be considered to be a process whereby the loss due to held stocks may be bounded. Thus, the expected gain from holding the hedged stock is $h=u-(q^*-q)\geq q-p-m$, where $q-p-m$ is the cost of delivery of the basic grade on the futures contract. It should be recognized that losses can be made on hedged inventory despite the fact that the loss is bound to $q-p-m$ [7, pp. 1013–14]. In completing his analysis, let us assume that the density function (random variables p^* and q^*) of the expected returns from hedging are symmetrical. Then the owner of unhedged stock has risk (gain or loss due to price change) equal to the variance of u (var p^*): Given p and m the owner of a unit of hedged stock has risk equal to var p^*+var q^*-2 cov p^*q^*. Then as the proportion of hedged stock to unhedged is varied, the risk involved ranges from var p^*+var q^*-2 cov p^*q^* to var p^* [7, p. 1014].

So much for the mathematical analysis. How can this situation be represented graphically? Stein uses indifference curves to denote equal utility given by varying the amount of hedged and unhedged stocks. The indifference curves rise at an increasing rate—assuming a declining marginal utility of income. The expected return with all stock unhedged, U, and the expected return of hedged stock H form the price line HU and give the expected returns as risk and unhedged stocks are increased at the same time. The equilibrium position denoted by A gives the point of optimum hedging position. Suppose that hedged stock gives a more favorable return $H'U$. Now the optimum amount of hedged stock is B. Even with a decrease in risk the amount of unhedged stock has decreased (hedged stock increased). Note there are two factors influencing the amount of hedged stock. If the profitability of the cattle feeding had increased only, that is all returns, hedged and unhedged were increased proportionally, then the optimum amount of hedging would be at point C and unhedged stock would be decreased by the amount CA. This is called the income effect. However, in this illustration, hedging has increased expected return and the unhedged returns are constant, thus shifting the slope of the price line. This results in an extra amount of decrease in unhedged stock (CB) to make a total increase in hedged stock equal to AB. This says that promises of a successful or more profitable hedge should increase the amount of hedging used, as was hypothesized by Working. In support of the above analysis and the Working theory, Dr. John Ferris, Michigan State University's Department of Agricultural Economics and marketing editor of *National Livestock Producer* says: "If the cattle feeder is able to find a consistent pattern of basis from year to year, then he may hedge not only to protect himself from a sharp price drop, but also to profit on basis change" [6, p. 3]. The most important aspect of this type of philosophy is to establish the proper relation-

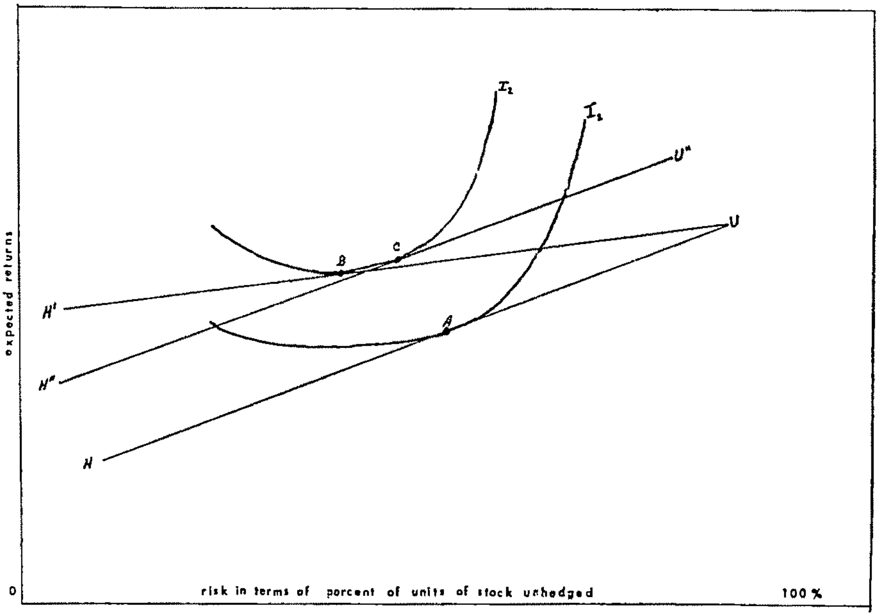

Figure 2. Equilibrium positions for hedged and unhedged stock

ships between the cash and the futures price. It must be remembered that a bad hedge is just as bad as poor speculation in terms of dollar returns—that is, it is possible to hedge yourself out of any profit that is to be made on the existing market [6, p. 22].

Johnson [5] has also proposed an interesting analysis of hedging decisions. He uses the variance of the subjective dollar return probability function within time period t_1 to t_2 as a measure of the price risk involved in holding commodities, either in the spot or the futures market. Assume, as before, that market i is spot and j is future. Then the price risk of holding x_i units in market i is $x_i^2\sigma_i^2$ and in market j, x_j units is $x_j^2\sigma_j^2$; the covariance of the price change between i and j gives the price risk of a combination of positions in markets i and j. The total variance of return $V(R)=x_i^2\sigma_i^2+x_j^2\sigma_j^2+2x_ix_j\operatorname{cov}_{ij}$. Differentiating with respect to x_j and setting the expression obtained equal to zero, solving for x_j minimizes the variance of return for the combination of x_i and x_j.

$$\frac{\partial V(R)}{\partial(x_j)}=x_j+\frac{x_i\operatorname{cov}_{ij}}{\sigma_j^2}=0.$$

Substitute the value found for x_j and let $V(R)^*$ denote the total variance of return of the combination of units held in market i and in market j (x_i and x_j). Then

$$V(R)^* = x_i^2\sigma_i^2 + \frac{x_i^2 \operatorname{cov}_{ij}^2}{\sigma_j^2} - \frac{2x_i^2 \operatorname{cov}_{ij}^2}{\sigma_j^2}$$

or

$$V(R)^* = x_i^2\left(\sigma_i^2 - \frac{\operatorname{cov}_{ij}}{\sigma_j^2}\right).$$

By definition the $\operatorname{cov}_{ij}/\sigma_j^2$ is the correlation coefficient of the trader. The above relation becomes $V(R)^* = x_i^2\sigma_i^2(1-p^2)$. Thus the larger the correlation coefficient, the greater the reduction of price risk of holding x_i that can be offset by carrying the hedge x_j [5, pp. 142–144]. The correlation coefficient is a measure of expected changes in the situation relative to the situation existing in reality. Thus, the more accurately a producer can judge the relationships of basis and the general price relationships, the more accurately the producer can determine the magnitude of the return to his operation before the cattle have been sold.

Close examination of this analysis reveals a basic difference between this theory and the Keynes–Hicks theory proposed earlier. The traditional theory measures price risk by the actual size of the gain. This approach, however, measures the effectiveness of the hedge by considering the gain or loss due to the price changes incurred in an unhedged position relative to those found in a hedged position. This, as in the Keynes–Hicks theory, can be determined only in subjective terms. It is measured by the extent to which the trader believes at t_1 the variance of return of holding x_i is reduced by holding x_j^* at some future time [5, p. 149].

Economic Effects of the Use of Hedging

What effects can the use of the hedge have on the market itself? For one thing, it is very evident that the use of any type of hedge, if skillfully applied, will reduce business risks, thus lowering margins. A hedger should also be able to judge more accurately what he can afford to pay than a buyer who is not using the futures market—that is, the futures market may serve as a guide for the formulation of future expectations [5, p. 141].

Is Theory Applied?

Ralph Boals, who farms a total of 677 acres and feeds 2,000 head of cattle as well as 2,000 head of hogs, hedges the cattle when he figures such a hedge "will pay off." He also uses the futures market to fix the cost of his feed for the cattle since he estimates the feed to represent 65 percent of his total budget [2, p. 8]. Another farmer, Lee Schuster of Schuster Farms, which consists of 3,000 acres along with 15,000 hogs and a beef cow herd of 700 cows with the calves fed out, uses the hedge. He adds that "a continuing knowledge of the market, studied judgment, and the strength of your convictions are musts for the stabilized use of this management tool" [2, p. 8].

Conclusions and Final Comments

The immediate value of complete mastery of the economic theory supporting these hedging decisions might not be recognized by the cattle producer if it were presented to him, but he is still analyzing the situation on the basis of the relative profitability to him as a profit seeker. Although the use of the hedging tool as a risk remover is a valid generalization, it seems only logical to try to avoid hedging if the expected price movement is favorable for the producer or the trader. On the other hand, producers who do not have the intuitive feel for changes in market conditions may find the use of hedging is justifiable in order to avoid the gyrating prices of the spot market, thus indicating that both theories explored in this paper may have validity in the real world.

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AMERICAN
AGRICULTURAL ECONOMICS ASSOCIATION
REPORTS AND MINUTES
1967-68

REPORT OF THE PRESIDENT

This has been an important year in the history of the American Agricultural Economics Association. Effective January 1, 1968, the name of the American Farm Economics Association was changed to the American Agricultural Economics Association, and the name of the JOURNAL OF FARM ECONOMICS was changed to the AMERICAN JOURNAL OF AGRICULTURAL ECONOMICS. The American Agricultural Economics Association was incorporated in the State of Iowa on December 28, 1967. It is incorporated with a registered office in the Department of Economics at Iowa State University in the city of Ames. The registered agent is Neil E. Harl, to whom this Association is greatly indebted for his untiring efforts and sage advice over the past two years. The corporation has been registered with the Internal Revenue Service, and in view of its educational purpose has been accorded an exemption from federal income taxes.

Last evening, the Executive Board of the Association adopted a slate of bylaws. These bylaws will be published in the proceedings issue of the JOURNAL.

The changes that have been effected have placed our Association on a much more business-like basis and have made it a much more democratic association. Membership on the Executive Board is distinctly different from membership on the executive committees through which the business of this Association has been conducted in years past. The Executive Board is larger than the former Executive Committee, providing more channels through which members of the Association can express their views with regard to the activities of the Association. This is of particular significance when it is noted that the framers of the constitution included a provision instructing the nominating committee "to take full cognizance of the need for geographical, functional and organizational representation on the Executive Board." These changes virtually assure a shift in the power structure of the Association and a much more democratic structure in the future.

In view of the changes taking place in the structure of the Association, this appeared to be a good year in which to initiate a serious examination of the relevance of agricultural economics as a profession and the relevance of this Association to its members. A special committee chaired by L. R. Martin was appointed to review postwar research in agricultural economics in terms of its relevance to our time and to the unfolding challenges of the years ahead. This committee will submit a proposed program of work to the Executive Board for its consideration at the December meeting.

As a part of our continuing critical review of our professional efforts, we are cooperating with the Committee on Education Needs in Agriculture and Natural Resources (CENAR) in a study of the social science needs of undergraduate students in agriculture and natural resources and the adequacy of existing curricula. This committee expects to complete its report during the calendar year of 1968.

An Extension Activities Committee, operating under the chairmanship of

John Dunbar, has given surveillance to extension programs in agricultural economics and offered suggestions concerning ways in which the Association can render greater service to the members of the profession engaged primarily in extension work.

The Industry Committee, under the leadership of Dale Butz and Ronald Aines, undertook a detailed study of the needs of industry and ways in which this Association could contribute more effectively to meeting these needs. The committee made suggestions for improved coordination between industry and institutions providing higher education in agricultural economics. Specific recommendations include the establishment of an exchange seminar program and creation of opportunities for short-term assignments of university personnel with industry.

This year the Student Affairs Committee of the AAEA is 20 years old. We should take pride in the accomplishments of this section of our Association. There are now 44 chartered chapters of the student section. The interest in student activities at the annual meeting of the Association is at a very high level. I would like to commend the Student Affairs Committee, and Kenneth Boggs in particular, for the fine job that they are doing in making our Association meaningful to undergraduate students.

The Committee on Retrieval of Agricultural Economics Literature has continued to study ways in which retrieval can be simplified. The committee has recommended that the Association join with the National Agricultural Library in the creation of an American Agricultural Economics Documentation Center. The Center would develop an abstract and retrieval system to provide more efficient recall of agricultural economics literature. Copies of the report of the committee were made available to you as you entered the hall this morning. This proposal should receive our most serious consideration. Last evening, the Executive Board voted to appoint a subcommittee of the Board to work with the Retrieval Committee in revising the report and in seeking support from foundations and others to operate the program for five years on a trial basis.

The awards programs of the Association were coordinated this year under the leadership of Emery Castle. The committee has endeavored to establish uniformly high criteria for all the awards provided under the auspices of this Association.

Membership in the Association continues to increase. As of December 1967, there were 4,143 individual members in 98 different countries. The total number of members and subscribers was 5,656. As the program to increase the service of the Association to the members becomes effective, our membership should increase accordingly.

Interest in our professional journal remains at a very high level. The supply of articles is increasing. In the future, the Association must consider whether the JOURNAL as now constituted provides an adequate outlet for publishing the literature produced by the members. There is an increasing interest among the members in the development of another vehicle for the publication of articles that are not so highly research-oriented as those now published in the AMERICAN JOURNAL OF AGRICULTURAL ECONOMICS.

I would like to express my appreciation to Earl Swanson and to his associates for the fine job that they have done in editing the JOURNAL during the last three years. I would also like to acknowledge the leadership shown by the new editor, Varden Fuller, and his associates in planning for the issues ahead.

The budget of the Association continues to grow. If the Association is to render meaningful service to its members, it is essential that it be prepared to underwrite the costs of these services. While the costs of some of the activities of the Association may be covered from the reserves of the Association, it would seem prudent to continue to assess the members to cover the costs of programs designed largely to provide services to the members.

I am grateful for the honor and privilege of serving as president of this Association. The cooperation received from the members in undertaking the many functions of the Association has made this year most enjoyable. I owe a debt of gratitude to all who have assisted in the programs of the Association. I should also like to express appreciation to the members of the Western Agricultural Economics Association for the privilege of cooperating with them in this annual meeting. President Smith gave effective leadership in the development of the program. We are particularly grateful to Montana State University and to the members of its faculty of the Department of Agricultural Economics for the effective planning demonstrated in making the local arrangements for this meeting. I am also indebted to E. Clinton Stokes of the U. S. Chamber of Commerce for the local arrangements at the meeting of the Association in Washington last December.

C. E. BISHOP, *President*

RESOLUTION

Acknowledging the great hospitality shown the members of the American Agricultural Economics Association, their families and guests, on the occasion of the annual meeting the association held jointly with the Western Agricultural Economics Association at Montana State University on August 18–21, 1968:

Be it resolved that the American Agricultural Economics Association expresses its sincere gratitude to President Johnson and the staff of Montana State University, and to the members of the Department of Agricultural Economics and their wives, who, under the leadership of Richard McConnen, Gail Cramer, and Mrs. Dorothy Eck, contributed greatly toward the planning and successful execution of this joint meeting with the Western Agricultural Economics Association.

Be it further resolved that a copy of this resolution be sent to President Johnson, Professor McConnen, Professor Cramer, Mrs. Eck, and to other persons as appropriate.

REPORT OF THE SECRETARY-TREASURER

The close of 1967 also brings to an end the activities of the American Farm Economic Association. The membership in the last year was widespread, with 4,143 individual members in 98 different countries and on all the continents of the world. Our JOURNAL OF FARM ECONOMICS was sent to 3,286 individual members in the United States and about one-fourth that many abroad (Table 1). The JOURNAL was also sent to 558 domestic libraries and 923 libraries in foreign countries. There were 29 businesses which supported the activities of the Association with a Sustaining Membership.

Table 1. American Farm Economic Association: number of members and subscribers, 1967

Category	Number
Sustaining members	29
Regular members: United States	2,679
Foreign	587
Junior members: United States	617
Foreign	64
Corresponding members	196
Libraries and businesses: United States	558
Foreign	923
Exchanges	3
Total	5,656
Number of copies JFE	5,767

The development of the Association as reflected by number of members and JOURNAL subscribers has been one of steady growth. In recent years the foreign membership, although statistics are not available, and foreign subscriptions have been expanding more rapidly than have other categories.

For the six months ending December 31, 1967, the cash receipts from dues amounted to $15,899.95. The claims of members for JOURNALS were reduced by $16,339.40. With adjustments for news agency payments and minor refunds, the net amount available from dues and subscription payments was $32,528.85. Dividends and interest on investments provided $3,150.43 in income, and back issues and reprint purchases each brought in about $1,770. The total income was $40,053.08.

Because the report covers only a part of the year, the expenditures are not typical of what may be expected for future years. The incidence of various items depended on when in the AFEA year the activity occurred.

The JOURNAL OF FARM ECONOMICS printing was as usual the large item of expenditure. The cost of polling the members on the constitutional change and of effecting part of the change in the organization came to $2,112.50. Some additional costs of this nonrecurring event will be borne in the next year's business of the newly named and reorganized Association.

Although there was a net operating loss for the period, this is of no real concern in view of the fact that this is a six months' report covering a period of reorganization and transition.

Table 2. American Farm Economic Association: members and subscribers to the JOURNAL OF FARM ECONOMICS

Year	Members				Subscribers			Total members & subscribers	Number of copies of JFE
	Regular	Junior	Corresponding	Sustaining	United States	Foreign	Exchange		
1919								561	
1920								**	
1921								569	
1922								**	
1923								674	
1924								722	
1925								803	
1926								822	
1927								775	
1928								886	
1929								974	
1930	650	*	*		179	114		943	
1931	695	*	*		173	133		1,001	
1932	675	*	*		163	133		971	
1933	622	*	*		157	127		906	
1934	613	*	*		197	131		941	
1935	739	*	*		199	150		1,088	
1936	765	*	*		198	157		1,120	
1937	**	**	**		**	**		1,191	
1938	**	**	**		**	**		1,229	
1939	389	*	*		214	166		1,269	
1940	398	*	*		209	141		1,248	
1941	919	*	*		207	129		1,255	
1942	748	*	*		202	77		1,027	
1943	329	*	*		214	74		1,117	
1944	784	*	*		227	91		1,102	
1945	845	*	*		229	91		1,165	
1946	1,044	*	*		244	160		1,448	
1947	1,230	*	*		327	205	11	1,773	
1948	1,310	*	*		310	235	11	1,866	
1949	1,484	*	*		321	219	11	2,035	
1950	1,439	*	*		313	220	12	1,984	
1951	1,664	*	*		307	272	12	2,255	
1952	1,641	*	*		321	317	0	2,279	
1953	1,802	*	*		304	341	1	2,448	
1954	1,927	*	*		307	355	1	2,590	
1955	1,945	*	*		269	351	1	2,566	
1956	2,244	*	*		335	425	1	3,005	
1957	2,438	*	*		323	486	9	3,256	
1958	2,423	*	55	7	347	529	17	3,378	
1959	2,227	310	146	13	359	572	17	3,644	
1960	2,321	289	160	24	359	592	17	3,762	
1961	2,654	444	183	23	381	574	17	4,276	
1962	2,576	542	167	18	391	638	16	4,348	4,435
1963	2,672	564	203	18	412	694	15	4,578	4,670
1964	2,982	465	195	16	440	739	15	4,852	4,956
1965	3,068	542	168	16	462	787	1	5,044	5,157
1966	3,325	677	155	25	506	861	1	5,550	5,736
1967	3,266	681	196	29	558	923	3	5,656	5,767

* in regular member total.
** not available.

Table 3. American Farm Economic Association: income and expense statement for six months ending December 31, 1967

Income		
Dues and subscriptions:		
Regular members	$3,307.50	
Joint members	881.00	
Junior members	1,294.50	
Subscriptions	8,478.95	
Corresponding members	1,638.00	
Sustaining members	300.00	
		$15,899.95
Plus: Increase in Franklin Square subs payable		342.00
Decrease in prepaid dues		16,339.40
		$32,581.35
Less: Refunds and NSF checks		52.50
		$32,528.85
Dividends and interest		3,150.43
Back issues		1,773.25
Reprints		1,772.86
Advertisements		627.20
Miscellaneous		200.49
TOTAL		$40,053.08
Expense		
JOURNAL printing (including $15,068.38 for Dec. JFE)		$27,053.78
Editor's expense		354.58
Editorial assistant		3,014.58
Printing reprints		1,023.19
Purchase back issues		317.00
Postage & wires		473.44
Office supplies & stationery		546.07
Annual meetings		539.84
Research awards		2,601.99
Student affairs		856.96
Joint dues:		
Collected	$ 257.50	
Remitted & charges	295.48	
Difference		$ 37.98
Membership Committee postage		55.79
Reorganization expense		2,082.59
Audit		150.00
Secretary–Treasurer:		
Honorarium		1,500.00
Secretary		2,112.50
Other help		1,264.19
IBM machine usage		338.50
Miscellaneous		40.42
TOTAL		$44,363.40
Net operating loss		−4,310.32

The net worth of the Association with all assets valued at cost was $58,830.20 on December 31, 1967. This included stocks and bonds worth about $162,527 on the market but having a book value (cost) of $87,564.89.

There were only a few items owed by the Association at the end of the year except for claims of members and subscribers who had made payments for 1968 and subsequent years and the cost of the December 1968 issue of the JOURNAL OF FARM ECONOMICS, which was in the hands of the printer but had not been published and distributed to the members and subscribers.

Table 4. American Farm Economic Association: balance sheet, December 31, 1967

Assets		
Cash		$ 1,524.00
Franklin Square account receivable		648.00
Investments (at cost)		
Corporation bonds	$22,936.91	
Listed stocks	64,627.98	
(Market value approx. $162,527)		87,564.89
TOTAL		$89,736.89
Liabilities		
Due CAES		$ 7.00
Due Cornell for secretarial assistance		929.96
Prepaid membership dues		14,556.50
IRS taxes due		344.85
Printing cost of December JFE		15,068.38
TOTAL		$30,906.69
Net worth		
Balance July 1, 1967	$63,140.52	
Plus: Net operating loss	4,310.32	
Balance December 31, 1967		$58,830.20
TOTAL		$89,736.89

Over the years the Association has accumulated a fair-sized "endowment fund" mostly from moneys raised specifically for this purpose. This fund is mainly to give the Association financial stability and to enable the Association to undertake activities which might not be possible within the limits of the current operating budget for any single year.

Table 5. American Farm Economic Association: assets at market value

Date	Market value of assets
Dec. 31, 1922	$ 255
1923	175
1924	−381
1925	−437
1926	50
1927	1,123
1928	2,398
1929	3,464
1930	5,392
1931	6,789
1932	7,711
1933	8,768
1934	10,587
1935	12,315
1936	12,658
1937	16,958
1938	21,150
1939	24,135
1940	26,010
1941	25,600
1942	28,326
1943	35,710
1944	43,047
1945	50,614
1946	52,647
1947	53,603
1948	61,745
1949	72,333
1950	NA
June 30, 1951	73,316
1952	74,194
1953	75,002
1954	84,713
1955	94,429
1956	98,401
1957	89,923
1958	83,175
1959	109,105
1960	116,549
1961	136,144
1962	114,108
1963	159,644
1964	179,919
1965	188,262
1966	186,877
1967	165,963
Dec. 31, 1967	162,527

As the affairs of the American Farm Economic Association are closed out and those of the successor association are commenced, it would appear that AFEA has done well over the years. This is reflected by the number of members it has in the United States and around the world, by the demand for its journal by members and libraries and institutions, and by its financial well-being as its books are closed and its assets passed on to the American Agricultural Economics Association.

C. D. Kearl, *Secretary–Treasurer*

AUDIT REPORT

Board of Directors
American Farm Economic Association
Ithaca, New York

Gentlemen:

We have examined the balance sheet of American Farm Economic Association at December 31, 1967, and the related statement of income and expense for the period then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as are deemed necessary in the circumstances.

Pursuant to authorization by the general membership and executive committee, the Association was reorganized and incorporated as of January 1, 1968 as the American Agricultural Economic Association, Inc.

In our opinion the accompanying balance sheet and statement of income and expenses fairly present the financial position of the Association at December 31, 1967, and the results of its operations for the six months then ended, in conformity with generally accepted accounting principles applied on a basis consistent with the prior year.

Respectfully submitted,
Maxfield, Randolph & Carpenter
Certified Public Accountants
First National Bank Building
Ithaca, New York 14850

May 1, 1968

REPORT OF THE INVESTMENT COMMITTEE

This will be the last report of the Investment Committee of the American Farm Economic Association.

Table 1. American Farm Economic Association: summary of investments, December 31, 1967

Item	Income July 1 through Dec. 31, 1967	Value	
		Cost	Market
Stocks			
On hand July 1, 1967		$64,627.98	$146,236.62
Change during year			
On hand Dec. 31, 1967		64,627.98	143,860.75
Dividends received	$2,594.05		
Corporation bonds			
On hand July 1, 1967		22,935.91	19,725.00
Change during year			
On hand Dec. 31, 1967		22,936.91	18,666.25
Interest received	556.33		
Savings account			
(Tompkins County Trust)			
On hand July 1, 1967		1.00	1.00
Change during year		−1.00	
On hand Dec. 31, 1967		—	—
Interest received	.05		

During the year the only change in the investment portfolio was to withdraw the one-dollar deposit in the savings account and close the account. There seemed to be no reason for continuing such an account (Table 1).

Although there was no change in the holdings of stocks and bonds, the market value of both fell. Our stocks are all "blue chip" and on the present market the buyers have been interested in stocks which have more "glamor." Consequently, although some of our stocks have increased in price since July, others have fallen, and overall there has been a slight decrease in total value (Table 2).

The Investment Committee feels that, in keeping with the policy of having our investments as a reserve, the retention of a high-quality portfolio such as we now have is in order.

In the last half of 1967 we received $2,594.13 in dividends.

Table 2. American Farm Economic Association: stocks, Dec. 31, 1967

Company[a]	Inventory 12/31/67		Dividends received	Market value	
	Number of shares	Original cost	7/1/67 through 12/31/67	6/30/67	12/31/67
Am. Tel & Tel (A +)	288	$11,421.11	$ 316.80	$ 16,632.00	$ 14,508.00
Borden Company (A +)	228	2,162.41	136.80	7,980.00	8,008.50
Chase Manhattan Bank (A)	62	1,115.09	68.20	3,789.75	3,820.75
Clark Equipment (A −)	600	2,200.67	360.00	19,200.00	15,750.00
Comm. Edison Co. (A +)	232	7,467.14	255.20	10,904.00	10,904.00
Continental Can (B +)	150	4,315.38	150.00	8,437.50	7,387.50
General Electric (A +)	150	1,920.57	195.00	12,993.75	14,400.00
Jewel Tea Co. (A)	100	3,875.94	62.50	3,050.00	3,312.50
Owens-Ill., Inc. (A)	140	2,925.35	94.50	7,367.50	8,050.00
Sears, Roebuck (A +)	304	1,845.38	152.00	16,644.00	17,442.00
Std. Oil, Indiana (A)	400	7,356.68	380.08	22,950.00	21,650.00
Std. Oil, N.J. (A +)	153	10,325.36	283.05	9,275.62	10,327.50
Texaco (A +)	100	7,696.90	140.00	7,012.50	8,300.00
Total		$64,627.98	$2,594.13	$146,236.62	$143,860.75

[a] Standard and Poor's rating for earnings and dividends shown in parentheses.

The increases in interest rates have adversely affected the price of our bonds, but these provide us with a somewhat balanced investment portfolio (Table 3). Our bonds returned $556.33 in interest during the last half of 1967.

Table 3. American Farm Economic Association: corporation bonds, Dec. 31, 1967

Item	12/31/67		Interest 7/1/67 through 12/31/67	Maturity	
	Inventory (at cost)	Market value		Value	Date
Am. Tel & Tel	$ 5,046.91	$ 4,165.00	$128.13	$ 5,000.00	4/1/01
Iowa Ill. Gas & Elec.	5,200.00	4,268.75	121.90	5,000.00	5/1/91
Pacific Tel & Tel	10,650.00	8,612.50	256.30	10,000.00	2/1/93
Witco Chemical Co.	2,040.00	1,620.00	50.00	2,000.00	6/1/80
Total	$22,936.91	$18,666.25	$556.33	$22,000.00	

The members of the American Farm Economic Association have provided its successor organization with a sound "endowment" to help assure its financial stability and to help to enable it to pursue such activities as are in the interest of the profession. The Executive Committee of the AFEA at its meeting at Maryland, August 21, 1966, accepted for publication and reference to the members a report setting forth an AFEA "Endowment Fund" policy. This was published in Volume 48, Number 5 of the JOURNAL OF FARM ECONOMICS. It is suggested by this committee that the general policies outlined in that report serve as policy guide lines as the new organization takes over custody of the "Endowment Fund" established by the American Farm Economic Association.

Prepared for the Investment Committee by
C. D. KEARL
Secretary–Treasurer

AMERICAN AGRICULTURAL ECONOMICS ASSOCIATION
1969 BUDGET

Receipts	
AAEA dues and subscriptions	$53,035
Corresponding members	1,500
Sustaining members	4,000
Sale of back issues	5,290
Sale of reprints	4,050
Advertising	500
Annual meeting	1,275
Interest and dividends	6,110
Miscellaneous	680
	$76,430
Expenses	
JOURNAL printing	$45,000
Editor's postage, etc.	600
Editorial support	7,000
Printing of reprints	2,770
Purchase of back issues	300
Student affairs	960
Awards program	3,100
Annual meeting expense	2,125
Postage and telegrams	1,200
Secretary–Treasurer assistance	6,900
Secretary–Treasurer honorarium	3,000
Office supplies	500
IBM machine hire	150
Bonds	140
Miscellaneous	250
	$73,995
Balance	+ $2,335

REPORT OF THE EDITOR

The attached table summarizes our manuscript activity during the period from July 1, 1965, through June 30, 1968.

The total of 625 new submissions received during this period represents an approximate 20-percent increase over the three-year total of 513 reported by the previous editor ("Report of Editor," J. FARM ECON. 47:1608–09, Dec. 1965). Because our term of office was extended to include the November and December issues for 1968, the data for disposition of manuscripts in the 1967-68 column of the table includes manuscripts scheduled for publication in the November 1968 issue. Over the entire three-year period we published 283 or about 44 percent of the 640 manuscripts which were received and upon which a decision regarding publication was made. This acceptance rate is almost the same as the 46-percent rate reported by James Nielson, the previous editor. However, the data are not strictly comparable because our table includes an additional regular issue (November 1968). Thus, there has been a larger drop in the acceptance rate than the comparison indicates.

In addition to the summary given in the table of the regular issues and the proceedings papers for the annual meetings, we processed two extra issues of the JOURNAL at the request of the executive committee of AFEA. The 13 prize-winning essays on "Effective Competition and Changing Patterns in the Marketing of Agricultural Products" were published as Part II of the August 1966 issue. The seven papers given at the Symposium for Teachers of Agricultural Economics which was held at Virginia Polytechnic Institute August 17–20, 1966, were published as Part II of the February 1967 issue.

During the last three years many persons have cooperated in helping us toward our objective of a high-quality professional journal. It is appropriate to recognize some of these contributions in this final report for my term of office. Soliciting and obtaining competent reviews of manuscripts is a critical factor in decisions regarding publication. Thanks are due to members of the Editorial Council for their substantial effort in manuscript review. The scope of the review process was such that we received manuscript reviews from a total of 485 persons not on the Editorial Council. This response indicates a broad base of support for the JOURNAL and was an important source of encouragement. We have attempted to maintain the tradition of passing the comments of reviewers on to the authors, regardless of whether the manuscript was accepted or rejected. In most cases we felt that authors were helped by these evaluations, even if the manuscripts were not published in our journal.

Thanks are also due to Leonard Schruben, book review editor. His selection of relevant books and competent reviewers permitted maintenance of a high standard in this section of the JOURNAL.

Special recognition goes to my colleague, Lyle Fettig, who handled the entire operation during my absences from the campus. His aid and counsel during the last three years have been most helpful, and it is due to his willingness to handle the November and December 1968 issues that the term of office of the editor will now coincide with the calendar year.

Our editorial assistant, Ruth Stillwell, contributed substantially to an improvement in exposition of the material in manuscripts appearing in the regular and the proceedings issues. She also helped to enforce a high standard of literature citation. Penny Fetzer, our office secretary, efficiently performed the tasks of supporting our operation with matters relating to correspondence and the maintenance of our files.

Recognition is also due to the Department of Agricultural Economics at the University of Illinois for the provision of office space, the professional time of the editor and the associate editor, and secretarial services.

Finally, I am grateful to the Association and its officers for the opportunity of serving as editor. My view of the profession has been substantially enlarged by this experience and, as we close our accounts, I remain in debt to the Association.

EARL R. SWANSON, *Editor*

	1965-66		*1966-67*		*1967-68*		*Three-year summary*	
Manuscripts received								
Carried from previous year	47		62		75		47	
New submissions	218		195		212		625	
TOTAL		265		257		287		672
Disposition of manuscripts								
Accepted	87		96		100		283	
Rejected	116		86		143		345	
In hands of author for revision								
more than 1 year	—		15		1		1	
more than 6 mos. but less than 1 yr.	5		8		2		2	
less than 6 mos.	31		19		9		9	
In process of review	26		33		32[a]		32[a]	
TOTAL		265		257		287		672
Proceedings papers								
December issues (1965, 1966, and 1967)	70		97		85		252	
May issues (1966, 1967, and 1968)	22		10		15		47	
TOTAL	92		107		100		299	

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[a] These manuscripts were transferred to the new editor, Varden Fuller, on or before June 30, 1968.

REPORT OF THE MEMBERSHIP COMMITTEE

The activities of the Membership Committee were coordinated, as is necessary due to information available and to maintaining continuity of records, with the Secretary–Treasurer. The following membership activities were completed by mid-August 1968:

1. The Secretary–Treasurer reminded members of their dues payment in a November letter.
2. The Secretary–Treasurer mailed dues notices in January and a reminder again in March. Delinquent members were mailed another reminder in May.
3. In September, a letter prepared by the chairman of the Membership Committee was mailed from the Secretary–Treasurer's office to heads of departments asking their assistance in creating interest in AAEA membership among their staff and graduate students.
4. In July, the chairman of the Membership Committee sent a letter to each of the approximately 600 members who were still delinquent, encouraging them to renew their membership and reminding them again of the recent reorganizational adjustments toward strengthening our Association in the profession and to individual members.

W. J. LANHAM, *Chairman*

REPORT OF THE SUSTAINING MEMBERSHIP COMMITTEE

The Sustaining Members of the American Agricultural Economics Association for 1968 are as follows:

Agway, Inc.
  Syracuse, New York
Allied Mills, Inc.
  Chicago, Illinois
American Dry Milk Inst.
  Chicago, Illinois
Board of Trade of the City of Chicago
  Chicago, Illinois
Brown & Williamson Tobacco Co.
  Louisville, Kentucky
Campbell Soup Co.
  Camden, New Jersey
Cargill, Inc.
  Minneapolis, Minnesota
Central Soya Co., Inc.
  Fort Wayne, Indiana
Chicago Mercantile Exchange
  Chicago, Illinois
Continental Grain Co.
  New York, New York
Cotton Producer's Assn.
  Atlanta, Georgia
Dairymen's League Coop. Assn., Inc.
  New York, New York
Deere & Co.
  Moline, Illinois
Del Monte Corporation
  San Francisco, California
Peavey Co.
  Minneapolis, Minnesota
Pioneer Hi-Bred Corn Co.
  Des Moines, Iowa
Ralston Purina Co.
  St. Louis, Missouri
Register & Tribune
  Des Moines, Iowa
Staple Cotton Coop. Assn.
  Greenwood, Mississippi
Farmland Industries, Inc.
  Kansas City, Missouri
F. S. Services, Inc.
  Bloomington, Illinois
George A. Hormel & Co.
  Austin, Minnesota
Green Giant Co.
  Minneapolis, Minnesota
Harvest Publishing Co.
  Cleveland, Ohio
H. P. Hood & Sons, Inc.
  Boston, Massachusetts
Indiana Farm Bureau Coop. Assn.
  Indianapolis, Indiana
International Harvester Co.
  Chicago, Illinois
Kroger Co.
  Cincinnati, Ohio
Moorman Manufacturing Co.
  Quincy, Illinois
National Dairy Products Corp.
  Chicago, Illinois
Northeast Dairy Coop. Fed., Inc.
  Syracuse, New York
Northwestern Mutual Life Ins. Co.
  Milwaukee, Wisconsin
Oscar Mayer & Co.
  Madison, Wisconsin
Successful Farming
  Des Moines, Iowa
Traveler's Insurance Co.
  Hartford, Connecticut
Weitz-Hettelsater Engineers
  Des Moines, Iowa
Wilson & Co.
  Chicago, Illinois

There are thirty-seven. Eleven of these are new but three of the "old supporters" have chosen not to continue their Sustaining Membership.

The members of the Sustaining Membership Committee have served well in contacting businesses and encouraging them to give the Association this support. This effort is appreciated by the chairman of the committee. The success of the committee in obtaining enough memberships to exceed the budget estimate of both income from this source and the estimated cost of the awards program is appreciated by the chairman and should be by the Association membership.

C. DEL MAR KEARL, *Chairman*

REPORT OF THE INDUSTRY COMMITTEE

The Industry Committee of the American Agricultural Economic Association met during the year at the Federal Reserve Bank in Chicago (1) to discuss the implications and the further implementation of the survey conducted last year, and (2) to consider plans for activities at the coming summer and winter meetings.

The committee decided not to publish any further reports or recommendations based on the survey of industry economists conducted last year, but rather to let the results published in the JFE of December 1967, pp. 1608–1614, stand as a basis for consideration of actions by appropriate committees and officers of the AAEA. The committee stands ready to discuss with the Executive Committee or others implementation of action responses to the survey results.

The Fifth Annual Industry Dinner was held Monday evening, August 19, as part of the annual AAEA meetings at Bozeman, Montana. The dinner meeting was given publicity in trade publications and other places. It is hoped this will stimulate more agricultural economists working in industry to join AAEA and to attend the meetings. William Ervasiak of TAP, Inc., a consulting firm in Bozeman, was added to the committee membership as is customary to assist with local arrangements.

The committee is appraising the possibility of participating in the winter meetings and is seeking innovative means to improve meaningful communications and interchange between the various segments of the agricultural economics profession and thus realize greater hybrid vigor in research, education, and economic development programs to enhance complementary growth in academic, business, and governmental programs worldwide.

R. O. AINES, *Chairman*

REPORT OF FELLOWS ELECTION COMMITTEE

The committee met on May 29, 1968, at Chicago and selected John F. Booth, Maurice M. Kelso, and Elmer J. Working from the list prepared by the Executive Committee, to be made Fellows of the Association.

The committee edited the 1967 statement of the procedure by which Fellows are elected and recommends that it be published in the JOURNAL.

The committee proposes to next year's President and committee chairman that the committee do its work by means of correspondence and a telephone conference rather than by a meeting.

G. E. BRANDOW, *Chairman*

REPORT OF THE AWARDS COMMITTEE

In a memorandum of July 8 a tentative report was made to President Bishop on behalf of the Awards Committee. The items reported there still stand. A list of this year's award winners is attached. We make the following generalizations:

1. A new consolidated announcement of the awards was prepared. However, the subcommittee chairmen are encouraged to solicit entries as well.

2. Some minor problems were encountered with respect to Master's thesis judging. The number of theses submitted made it difficult to circulate the theses and obtain a decision prior to the meeting. At this point, no change in policy is recommended, although the logistics of the problem will be studied and, hopefully, improved upon.

3. A disappointingly small number (13) of published research award entries were submitted. The reason is unknown.

4. The following possible changes in the rules governing the awards program are called to the attention of the Executive Committee. These are not necessarily recommendations, but are matters on which questions have been raised and are appropriate items for the Executive Committee to consider.

a) At the present time, individuals over 41 years of age are not eligible to receive awards for published research. In the event this is to be changed, we suggest the following: "Only one award, or a part of one award in the case of joint authors, will be given to an individual over 41 years of age at the time of publication. Otherwise, eligible recipients must be under 41 years of age at the time of publication but may have older joint authors."

b) Problems have been encountered concerning the form in which Masters' theses are received. Sometimes reading is made difficult if a ribbon typewritten copy is not received. Some readers believe they suffer an unconscious bias as a consequence of reading carbon copies. In addition, theses are sometimes damaged in transit. The following is recommended: "Departments are strongly encouraged to submit either ribbon copies, in the case of typewritten theses, or Xerox or other processed copies of comparable quality."

c) A reference should be inserted into the announcement as follows: "The Awards Committee, with the approval of the President of the Association, reserves the right to make fewer than the announced number of awards when, in the judgment of the majority of the appropriate subcommittee, the quality of the entries does not warrant the making of the announced number of awards."

5. Question was raised about the eligibility of one of the published research award-winning publications. The publication is jointly authored. One of the authors had been the third author on a winning publication in 1966. The rules state, "No one may . . . receive an award in the same category more than once every three years." The Published Award subcommittee voted 9 to 1, with 1 abstaining, to concur with the decision of the Awards Committee chairman and the subcommittee chairman that the publication was eligible for consideration, but the author who had received one award in 1966 was ineligible to receive an award this year. The publication was handled in the same fashion as if he were more than 41 years of age.

Award Winners

Distinguished Extension Program Awards

J. B. Kohlmeyer, associate professor of agricultural economics, Purdue University.

Francis J. Smith, associate professor and extension economist, University of Minnesota.

Distinguished Undergraduate Teacher Award

Raymond R. Beneke, professor of farm management, Iowa State University.

Awards for Published Research

Gerald W. Dean and Norman R. Collins, *World Trade in Fresh Oranges: An Analysis of the Effect of European Economic Community Tariff Policies,*

California Agr. Exp. Sta., University of California, Davis, Giannini Foundation Monograph 18, Jan. 1967.
DALE COLYER AND GEORGE IRWIN, *Beef, Pork and Feed Grains in the Cornbelt: Supply Response and Resource Adjustments,* Missouri Agr. Exp. Sta. Res. Bul. 921 (North Central Regional Research Publication No. 178), Aug. 1967.
JOHN W. MELLOR, "Toward a Theory of Agricultural Development," in *Agricultural Development and Economic Growth,* ed. Southworth and Johnston, Cornell University Press, 1967, Chapter 2.

Award for Best Article in the JOURNAL OF FARM ECONOMICS

VERNON R. EIDMAN, GERALD W. DEAN, AND HAROLD O. CARTER, "An Application of Statistical Decision Theory to Commercial Turkey Production," J. FARM ECON. 49:852–868, Nov. 1967.

Doctoral Thesis Awards

TIMOTHY E. JOSLING, "The United Kingdom Grains Agreement (1964): An Economic Analysis," Michigan State University, under the direction of Dale E. Hathaway.
YAC-CHI LU, "Variable Elasticity of Substitution Production Functions, Technical Change and Factor Shares," Iowa State University, under the direction of Lehman B. Fletcher.
ABRAHAM SUBOTNIK, "The Development of an Econometric Model for Policy Decision-Making in Israel," Cornell University, under the direction of Daniel G. Sisler.

Master's Thesis Awards

RICHARD C. RAULERSON, "A Study of Supply-oriented Marketing Policies for Frozen Concentrated Orange Juice: An Application of Dynamo Simulation," University of Florida, under the direction of Dr. Max R. Langham.
GERALD DOEKSEN, "An Input–Output Analysis of the Structure of the Economy of Oklahoma," Oklahoma State University, under the direction of Dr. Charles H. Little.
MARVIN S. ANDERSON, "An Econometric Investigation of the Demand Relationships for Soybean Oil in the Production of Margerine and Shortening," Purdue University, under the direction of Dr. Richard C. Haidacher.

REPORT OF THE EXTENSION AFFAIRS COMMITTEE

The Extension Affairs Committee met at Guelph, Ontaria, in August and in Chicago, Illinois, October 13, 1967.

The committee submitted to President Bishop several proposals for the 1968 Annual Meeting program, some of which were adopted.

It was recommended that the Extension Awards Committee for 1968 be authorized to grant two Outstanding Extension Program Awards at the 1968 Annual Meeting, using existing criteria for the award. This recommendation received favorable action by the Executive Committee.

The committee felt strongly that a second Extension award should be established on a permanent basis for published materials applicable to Extension programs. At the request of President Bishop, the Extension Affairs Committee developed recommendations for such an award to be called the "Extension

Publication Award." The proposal was submitted to President Bishop for consideration by the Executive Committee.

The committee also developed a recommendation for an "Extension Affairs Committee" to be made a part of the permanent organizational structure of the Association. The purpose of this committee would be to develop programs and other activities to enhance the professional development of Extension agricultural economists and to strengthen the Association. This recommendation was also submitted to President Bishop for consideration by the Executive Committee.

JOHN O. DUNBAR, *Chairman*

REPORT OF THE STUDENT AFFAIRS COMMITTEE

Since 1948 the number of students and institutions participating in the Student Section activities at the Annual Meeting has expanded and the types and quality of the programs of the Student Affairs Committee and the Student Section have also improved. In addition, the Student Affairs Committee has taken active leadership in encouraging workshops and symposiums for teachers of agricultural economics, most of whom are members of our association.

This year we have 44 chartered chapters (local departmental clubs) of the Student Section. These chapters are divided as follows:

Canada No. of Schools	U.S. and Possessions No. of Schools	
	Land-grant	4-year non-land-grant
3	37	4
Ontario Agricultural College MacDonald College University of Alberta		Texas Technological Southern Illinois University A&T College of North Carolina Tennessee Technological

Since 1963 about half of the total number of chartered chapters have been represented at the Annual Meetings and from about 50 to 100 undergraduates have been present and participating in some way, either in the Student Section program or attending the meetings of the AAEA.

Contest Participation

	Schools (No.)			Students (No.)		
	Land-grant	Other	Total	Land-grant	Other	Total
	1967, Ontario Agriculture College, Guelph, Ontario, Canada					
Essay	11	2	13	17	4	21
Public speaking	11	2	13	15	3	18
Debate	7	3	10	14	6	20
	1968, Montana State University, Bozeman, Montana					
Essay	12	1	13	19	2	21
Public speaking	14	1	15	30	2	32
Debate	10	2	12	20	4	24

Implicit in figures shown above is an increased involvement by AAEA members. Were it not for the support of our undergraduate teachers and those who act as judges, etc., much of the improvement in our programs would not have been realized.

Student Section Progress 1967–1968

Two issues of the Student Section Newsletter were published in the spring of 1968. James Giles, University of Florida, was the editor this year and demonstrated excellent leadership in getting these issues out.

The Student Affairs Committee would like to operate only as an advisory-support body for the Student Section. However, there has been a lack of continuity in attendance from year to year even among elected officers. This, coupled with the fact that the student officers are typically faced with a new clientele each year, makes this virtually impossible. Some improvement in repeat attendance in the past several years has helped students get a better perspective of the Student Section, its relationship to the AAEA, and the function and role of the Student Affairs Committee. There has been some indication that improvement in repeat attendance and the level of individual responsibility will occur as the numbers of schools and student participation grow. Publishing the newsletter on a regular basis could help to maintain student interest and increase repeat attendance.

The program for 1968 was tentatively planned August 16, 1967, at the University of Guelph jointly by the Student Affairs Committee and the Student Section officers.

In our attempt to satisfy student requests for four rounds of preliminary debates, we have found this requires a great deal of time and so many people to act as judges, timekeepers, etc., that we have some difficulty in scheduling individuals when they prefer to serve. Response to our request for judges has been very good. It was excellent this year. A major share of credit should go to Wally Rehberg, R. J. Peeler, and Robert Taylor, Debate, Speech, and Essay Contest chairmen, respectively.

National Student Section Officers 1968-69

President—David Zwicker, University of Illinois
Vice-President—Jerry McReynolds, Kansas State University
Secretary–Treasurer—William Hoagland, Purdue University
Editor—Milton Reese, Louisiana State University

Financial Report

	1966-67	1967-68 (Budget only)	1969 (Tentative estimate)
Cash awards	$600.00	$600.00	$600.00
Honorariums for judges	140.00	200.00	200.00
Newsletter	—	75.00	100.00
Plaques, keys	93.44	85.00	100.00
Total	$833.44	$960.00	$1,000.00

1968 Student Award Winners

Essay contest

First: CLAUDE L. JONES, "Theory of Hedging on the Beef Futures Market," University of Illinois. Advisor: E. E. Broadbent.

Second: ROGER GINDER, "An Explanation of Retail Food Price Labels Between Metropolitan Areas," Southern Illinois University. Advisor: Lyle Solverson.

Third: LARRY G. HAMM, "Sources of Political Power in Agriculture," Pennsylvania State University. Advisor: W. T. Butz.

Fourth: WILLIAM GOTSCH, "Agricultural Cooperatives in Latin America," University of Idaho. Advisor: R. V. Withers.

Fifth: JAMES E. GILES, "Socio-economic and Political Consideration of a National Migrant Workers Organization," University of Florida. Advisor: Leo Polopolus.

Public speaking contest

First: ROGER RUTHERFORD, "Hunger Allows No Choice," University of Illinois. Advisor: Donald G. Smith.

Second: JAMES E. GILES, "An Unfulfilled Promise," University of Florida. Advisor: Leo Polopolus.

Third: SUE BARTON, "The Beef Cattle Futures Market," Ohio State University. Advisor: Francis McCormick.

Fourth: JOHN STOLL, "World Hunger: Synthetic Foods a Possible Solution," Kansas State University. Advisor: John Sjo.

Fifth: JOSEPH E. MITCHELL, "Which Way Farm Youth," North Carolina State University. Advisor: E. C. Pasour, Jr.

Debate contest

1968 debate question: "Resolved: that the government should establish a program to retard the movement of people from the farm to the city."

First: Purdue University, GARY WATSON AND BILL HOAGLAND. Coach: Ron D. Knutson.

Second: North Carolina State University, RONNIE KING AND BILLY EAGLES. Coaches: D. M. Hoover and R. J. Peeler, Jr.

Honorable mention: Southern Illinois University, MARLIN LARSON AND BRUCE STIKKERS. Coach: Lyle Solverson.

Honorable mention: University of Georgia: JIMMY PAYNE AND GERALD EUNICE. Coach: James O. Wise.

The Student Affairs Committee proposes that the Executive Committee activate a special planning committee (not necessarily the present members of the SAC) at the annual meetings this year to explore the possibilities for a workshop or symposium for undergraduate teachers of agricultural economics to be held either in 1969 or in 1970 prior to the summer meetings. We would hope that such a planning committee would explore the alternatives appropriate to such a workshop or symposium as well as the location and time for such an activity. Hopefully, this planning committee would report back to the Executive Committee at the winter meetings.

Students, members of the committee, and individual members of the association involved with coaching, advising, and/or judging students in the contests, and others who have attended AAEA-sponsored workshops and symposiums, appreciate the support given by the Executive Committee to the Student Affairs Committee and Student Section programs. We solicit the counsel of the Executive Committee in giving the Student Affairs Committee direction in making proposals or suggestions which will strengthen and be a credit to our professional association.

It has been a real pleasure to serve this association as chairman of the Student Affairs Committee this year.

KENNETH B. BOGGS, *Chairman*

REPORT OF THE COMMITTEE TO REVIEW POSTWAR WORK IN AGRICULTURAL ECONOMICS

The committee held an all-day meeting on July 14, 1968, in Chicago, to consider suggestions that post–World War II literature in several fields of agricultural economics be reviewed, for the benefit of professional workers and graduate students, both foreign and domestic.

One model outlined in the suggestions was the Rockefeller Foundation–financed series of review articles, published in the *American Economic Review, Economic Journal,* and *Econometrica.* Committees of the American Economic Association and the Royal Economic Society assumed responsibility for getting the reviews prepared. The review articles have also been published in a series of hard-cover books.

There was unanimous agreement that the suggestions have merit and are worthy of further study. There was complete agreement that it should not be undertaken unless it can be done well. This implies that means must be found to involve the best scholars in this undertaking.

It was also agreed that the project would be quite difficult to plan and execute. Much of the day was devoted to discussion of the philosophy to govern the effort, possible systems for dividing agricultural economics up into fields, what simple reviews might look like, what agricultural economists might be able to prepare fine reviews, and how the review articles might be published. The range of estimates ran from 6 or 7 review articles to as many as 20 or 25.

While there was no general agreement on the optimum magnitude of the effort, there was agreement on the strategy of proceeding sequentially rather than in one massive effort.

The Committee agreed to meet again during the annual meetings, if a time can be found. Each member will bring an outline of a sample area that might become the subject for a review paper. These outlines will be exchanged and will provide part of the basis for a two-day meeting in Chicago before the Christmas meetings.

These outlines include the following subjects: (1) overview of the field and its problems, (2) agricultural economics data and their generation, (3) quantitative analysis in agricultural economics, (4) resource economics, (5) agriculture in economic development, and (6) rural poverty.

The Review Committee recommends that the Executive Committee leave the question open and authorize further consideration by the Review Committee. These additional deliberations will result in a formal report to the Executive Committee at the Christmas meetings, a report that will include definite recommendations.

LEE R. MARTIN, *Chairman*

REPORT OF THE COMMITTEE ON RETRIEVAL OF AGRICULTURAL ECONOMICS LITERATURE

The rapid growth of the agricultural economics profession and its literature is well known. The intraprofessional movement of its members and the high proportion of young agricultural economists, together with increasing pressure for efficiency in research, has created a very real need for the more effective use of agricultural economics literature.

The committee has concluded that a major step to solving this problem is the development of an announcement, abstract, and retrieval system which provides efficient and effective recall of literature for individuals and agencies requiring agricultural economics information. The system herein recommended involves:

1. Establishing an American Agricultural Economics Documentation Center with the National Agricultural Library, and the publishing of a bibliography on agricultural economics literature. The National Agricultural Library has agreed to the Center and will provide from its resources an agricultural economist as its share of the staff, contingent upon the fulfillment by the American Agricultural Economics Association of its proportion of the Center function.
2. The inclusion of author abstracts with all publications.
3. The establishment of an agricultural economics literature committee of the Association to provide supervision for the development of the Center.
4. A cost, net of NAL's contribution, of approximately $40,000 per year.

Detailed Recommendations

1. American Agricultural Economics Documentation Center (AAEDC)

The AAEDC will be established with the National Agricultural Library. The Center's primary function would be to publish a bimonthly "American Bibliography of Agricultural Economics." The bibliography would contain (1) the basic bibliographic information, such as authors, title, publisher, date, number of pages, etc.; (2) a set of terms that indicate the subjects, methodology, geographical area of study, time span in study, type of data, etc.; and (3) an abstract for all the significant current literature published by American agricultural economists and selected literature items published by nonagricultural economists but with high relevance to agricultural economics.

The American Bibliography of Agricultural Economics would contain three indexes: an author index, a corporate author index, and a subject index. An annual index will be published that will incorporate the entries in all the bimonthly indexes published during the year. All information would be maintained on computer tapes. Users searching over several years or making very detailed searches would make the search using the computer.

2. Abstracts

It is recommended that all agricultural economists include an abstract with each article, paper, bulletin, book, etc., that is published and with each speech that is given. This recommendation could be, in large part, implemented if all research organizations would require an abstract from the author(s) as a condition of publication. For significant publications the abstract would be included in the ABAE and a copy would be transmitted to the *World Agricultural Economics and Rural Sociology Abstracts.*

3. Agricultural Economic Literature Committee

A standing committee of the Association could be established to develop and implement the program of the Center under the general policy guidance of the Association. Its functions would include (1) determination of a policy for inclusion or exclusion of specific classes of documents in the ABAE, (2) establishment of guidelines for the selection of abstracts to be included in the ABAE, (3) selection of an appropriate format for the preparation of abstracts, and (4) making recommendations to the Association about the future course of the Center.

4. Costs

It is estimated that about 500 items would be included in each bimonthly issue, 3,000 each year. Each issue would contain about 75 pages. Abstracts would be included for a significant document *if* the abstract is published with the document.

The American Agricultural Economics Documentation Center could be staffed by two agricultural economists, a secretary, and a key-punch operator. *One of the agricultural economists would be hired by the National Agricultural Library* and would be assigned to work with the Center. The remaining personnel could be employed by the Association. The agricultural economist employed by the Association could be the editor and be responsible for the operations of the Center and the publication of the American Bibliography of Agricultural Economics.

It is estimated that the cost of the personnel and the operations of the Center, net of NAL's contribution, would be $30,000 a year. In addition, the estimated cost of publishing and distributing the ABAE is $10,000 a year.

Considerations Leading to the Committee's Recommendation[1]

The number of agricultural economists and the amount of agricultural economics literature is expanding. Professional obsolescence is becoming a bigger problem. This at a time of increasing interdisciplinary efforts which demand better communications among agricultural economists and with other social scientists.

Currently we are laboring under a literature announcement and retrieval system that is sporadic, uncomprehensive, unorganized, and poorly understood. Much literature is missed, much time is needed to make reasonable retrospective searches, and much effort is needed to be aware of what is being published. Consequently, agricultural economists make little use of the literature services that are now provided.

This nonuse leads to excessive duplication of research, unreasonable delay in the application of new technology and methodology, unreasonable delay in the application of new data and information to current policy questions, and delay or inability to respond to emerging social problems.

Journal articles and books are currently announced and retrieved much better than publications in any other form. For this and other important reasons, members of the profession are seeking to publish more of the material in journals. Since journal space in the professional journal is limited, members are publishing in other journals. If agricultural economists publish in a large number of journals, the literature announcement and retrieval problem will become even more confused.

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[1] Many of the problems listed here were documented by Dr. I. T. Littleton in his study of the agricultural economics literature situation [I. T. Littleton, "Publication, Indexing, and Retrieval of Agricultural Economics Literature," J. FARM ECON. 49:1561–72, Dec. 1967].

The National Agricultural Library is moving into a new building, developing computerized library systems, and expanding its collection of United States and international literature. The National Agricultural Library cannot publish an American Bibliography of Agricultural Economics, indexed and designed for a specific user group, such as the American Agricultural Economics Association. However, it is very willing to cooperate with the Association so that the Association can prepare and publish such a document.

A similar literature problem exists in many other countries. Some countries have set up documentation centers to help solve the problem.

In view of the situation described above, it is opportune that responsible action be taken now.

The Center must be located near a library with a good collection of agricultural economics literature. Many land-grant university libraries meet this condition. It is recommended that we work with the NAL because it is willing to supply some manpower, it is more automated and will continue to automate, it has operational the computer programs necessary for publishing a bibliography, its goal is to have the most complete collection of literature, and it can provide many complementary services.

We believe that the major retrieval problem is being able to discover those publications related to specific subject areas. This problem cannot be solved by publishing a *list* of recent publications. It can be solved only by assigning several subject terms to each piece of literature and providing an index of these subject terms.

We believe that if the announcement and the abstract were together the discovery and selection of relevant pieces of literature would be much easier. Thus, we recommend that abstracts be published with the pieces of literature and that the ABAE contain for selected pieces of literature both the announcement and the abstract. If the announcement is to be timely, it is necessary that the abstract appear in the publication.

Obtaining copies of publications, particularly those not distributed widely, is also part of the literature retrieval problem. The Center could help solve this problem by distributing, on demand, photo or micro-fiche copies of the publications. However, we recommend that this service and others that could be provided by the Center be delayed until the Center has accomplished its major goal of publishing the American Bibliography of Agricultural Economics. Cooperation with information centers in other countries is important if the long-run goal of optimum use of world agricultural economics literature is to be achieved. The details of such cooperation could be worked out by the Agricultural Economics Literature Committee and the staff of the American Agricultural Economics Documentation Center after they are established.

Suggestions

It is clear that, in spite of any action taken by the Association with respect to the establishment of an agricultural economics documentation center, little progress will be made in the more effective use of agricultural economics literature unless some steps are taken to educate members of the Association, including graduate students, in the use of literature services. Thus, we suggest that agricultural economics departments devote part of a graduate course to the use of literature services.

Members should be taught the strengths and weaknesses of such services as the *Bibliography of Agriculture*, the *World Agricultural Economics and Rural Sociology Abstracts*, the monthly list of agricultural experiment station publications, the ERS and SRS "Monthly Checklist of Reports," the list of "Material Added to the Giannini Foundation Library," etc. Students could also be taught how to write abstracts, select subject terms, and make retrospective searches using the ABAE and the computer.

FRED ABEL, *Chairman*

MINUTES OF EXECUTIVE COMMITTEE MEETING

December 27, 1967, Washington, D.C.

Meeting called to order by President C. E. Bishop at 1:30 P.M.

Present

Members: Bishop, Bachman, Witt, Ruttan, Breimyer, Nielson, Kearl.
Guests: Swanson, Harl, McConnen, Stokes, Perkins, Wharton.

1. Stokes reported on the arrangements for the Washington, D.C., meetings.
2. The minutes of the Executive Committee meeting and the annual business meetings held at Guelph, Ontario, Canada, August 15 and 17, 1967, as circulated to the members of the Executive Committee, were approved by consensus.
3. McConnen presented a budget for the AAEA annual meetings to be held at Montana State University, Bozeman, Montana, August 18–21, 1968.

   Nielson moved that registration fees for the meeting be set at
   $ 6 for single graduate students,
   $10 for graduate students with families,
   $ 8 for single regular members, and
   $12 for regular members with families.

   Seconded by Ruttan.

   After discussion, Bachman moved to amend the motion and set the fees at
   $ 6 for single graduate students,
   $ 9 for graduate students with families,
   $ 8 for single regular members, and
   $11 for regular members with families.

   Seconded by Breimyer. Passed. The original motion as amended was passed.
4. Swanson reported on the activities of the editor. The JOURNAL will be published as the AMERICAN JOURNAL OF AGRICULTURAL ECONOMICS beginning with the February 1968 issue. Varden Fuller will begin to receive manuscripts in midsummer and will be the editor of the JOURNAL effective January 1, 1969. His first issue as editor will be February 1969.

   The present editorial assistant will work for the Association through June, at which time other editorial assistance will be hired.

   Bishop reported that the University of California is to receive $3,500 for the last half of 1968 and $7,000 each year thereafter while the editorship is held at the institution, to help defray expenses incident to the editorship.
5. Secretary Kearl reported that the vote on the proposition, "Shall the Constitution of the American Farm Economic Association be amended by repeal thereof and adoption of the Constitution comprised of 14 articles which is attached hereto?" had carried by an affirmative vote of 1,312 yes and

27 no on a ballot conducted by mail, pursuant to Article IX of the Constitution in effect at the time of the vote. It was further reported that Article XIV of the Constitution adopted by the vote provided that "said ratification shall also constitute approval for the incorporation of the Association as a nonprofit corporation and filing of application for exemption from taxation under section 501 of the Internal Revenue Code of 1954 as directed by the executive committee of the predecessor organization." Whereupon, Witt moved:

a) That the officers of the Association be directed to complete incorporation of the Association by January 1, 1968, if possible, under the nonprofit corporation laws of the state of Iowa, and if not possible by such date, then as soon thereafter as may be convenient.

b) That the officers of the Association be directed to make prompt application for exemption from taxation for the Association as a corporation under section 501 (*c*) (3) of the Internal Revenue Code of 1954.

c) That until changed by action of the Executive Board, the address of the registered office of the Association in the state of Iowa shall be the Department of Economics, Iowa State University, Ames, Iowa, and that the name of the registered agent at such address shall be Neil E. Harl.

d) That the treasurer of the Association be directed to pay all actual costs of incorporating and obtaining exemption from taxation.

e) That the officers be directed to transfer all assets of the American Farm Economic Association to the American Agricultural Economics Association.

Ruttan seconded. Passed.

6. Harl discussed the procedure in applying for an IRS exemption certificate for the Association and presented a statement to be sent with such documents as the constitution of the Association and the letter of exemption for the AAEA in applying for the certificate. Suggestions were made for revision and further suggestions are solicited before January 7, 1968, when the application will be made.

   Nielson moved that the Articles of Incorporation as prepared by Harl and reviewed by the consulting lawyers be accepted. Witt seconded. Passed.

   Harl presented a draft of the bylaws. These are to be adopted by the present executive committee as it functions as the initial governing board for the Association. The official bylaws of the Association can be adopted when the Executive Board is elected and has its first meeting at the annual meetings in August 1968. Harl was directed to make several changes in the draft of the bylaws as presented. Copies of the revised bylaws will be sent to members of the initial governing board. Witt moved approval of the bylaws as presented and amended. Seconded. Passed.
7. Wharton reported the activities of the Exploration of Problems in International Research Committee. The committee in its first meeting prepared a list of suggestions for the Association in the area. These were discussed and will be the basis of further activities for the committee.
8. Bishop reported that the CEANAR study panel is still in the process of being appointed.
9. Kearl presented the audit by the firm of Randolph, Carpenter and Maxfield. Bachman moved acceptance. Seconded and passed.

Kearl is to check with Harl as to the need or desirability of having a CPA audit with the incorporation of the Association.

10. Perkins reported the activities of the Employment Committee in connection with the annual meetings. Several suggestions for the conduct of future activities were made. Witt moved acceptance of the report. Seconded and passed.
11. Bishop presented a request by the Extension Affairs Committee that the award in that area be increased to two or three. The proposal was made that two awards be made in 1968, using the present criteria for selection, and that later the awards be expanded to three, with the development of particular categories for awards for future years.

    Nielson moved that approval be given for making two awards in 1968, using the criteria presently established, and that the committees be requested to present to the Executive Board in August a more specific description for future awards. Seconded and passed.

    In establishing criteria for the awards, there was sentiment against establishing categories for awards but for encouraging the consideration of a wide variety of activities and particularly the development of innovations in extension work.
12. Bishop presented the proposal for review articles which was originally brought to the Executive Committee by Hathaway at the August 1967 meetings.

    Ruttan moved that the President appoint a committee to consider the matter and report to the Executive Board at its August 1968 meeting. Seconded. Bachman moved that the motion be amended to provide that the Association pay travel expenses for the committee to meet. Seconded and passed.

    The motion as amended was passed.
13. Kearl presented the budget for calendar year 1968, to replace the previous fiscal year budget. Witt moved acceptance of the budget as revised. Seconded and passed.
14. Bishop raised the question of the need for the Association to have an Ethics Committee. The matter is to be referred to the Professional Activities Committee.
15. Bishop brought to the Executive Committee an invitation for the Association to join the Scientific Manpower Commission. Action on the matter was postponed to a later date pending further investigation.
16. Bachman moved that resolutions be passed enabling the Secretary–Treasurer to carry out financial transactions for the Association under its new name with the Tompkins County Trust Company, Ithaca, New York, and to carry out activities in connection with the AAEA investments as directed by the Executive Board and the Investment Committee. Seconded and passed.
17. Bachman moved that the Secretary–Treasurer make arrangements to open an account with a reputable stock broker to facilitate the handling of the AAEA investment portfolio. Seconded and passed.
18. Bishop presented a tentative program outline for the August 1968 meetings and solicited suggestions.
19. A list of nominees for Fellow of the Association was prepared for submission to the Fellows Election Committee.

    Meeting adjourned at 8:25 P.M.

MINUTES OF MEETING OF INITIAL GOVERNING BOARD

August 18, 1968, Bozeman, Montana

Meeting called to order by President Bishop at 9:07 A.M.

Present

Members: Bishop, Witt, Breimyer, Nielson, Smith, Ruttan, Kearl.

Guests: Eddleman, Castle, Swanson, Hathaway, McConnen, Cramer, Southern, Toussaint, Hillman, Dunbar, Butz, Ackerman, Eck.

1. The newly elected members of the Board were invited to participate in the discussion along with the members of the Initial Governing Board of the Association.
2. Witt moved approval of the minutes of the AFEA Executive Committee meeting held at Washington, D.C., December 27, 1967. Seconded. Passed.
3. Bishop announced that Hathway had been elected as President-elect and that the newly elected directors are Southern, Dunbar, Toussaint, Butz, Hillman, and Wharton.
4. Bishop asked that the directors be given the opportunity to draw lots to determine their term of office. Breimyer moved that, in keeping with the intent of the Constitution to get wide representation on the Board, the selection be by lots with two groups, those with research and teaching as primary interest and those less directly associated with those fields. Seconded. Passed. Lots were drawn and the terms of office are to be as follows: Southern one year, Hillman one year, Butz two years, Wharton two years, Dunbar three years, and Toussaint three years.
5. McConnen, Cramer, and Eck reported on arrangements for the hosting of the meetings.
6. In response to the report which indicated that there might be a small deficit in the finances for the meeting, Breimyer moved that the Association underwrite any deficit in connection with the hosting of the meetings and request that any surplus revert to the Association. Seconded. Passed. Eck reported arangements for meetings publicity.
7. Bishop reported that the Association is incorporated, with the official office being the Department of Agricultural Economics, Iowa State University, and that Neil Harl is the Association representative. The Association has been recognized as a nonprofit organization by the Treasury Department.
8. Kearl presented the report of the Secretary–Treasurer.
9. Kearl presented the audit report of Maxfield, Randolph, and Carpenter, certified public acountants. Nielson moved acceptance of the auditor's report. Seconded. Passed.
10. Kearl presented a report for the Investment Committee. Ruttan moved acceptance. Seconded. Passed.
11. Breimyer reported on the steps which have been taken to obtain a new Secretary–Treasurer. It was noted that future appointments will be for one year with provisions for reappointment.
12. Swanson reported the activities of the Editor. Breimyer moved that the Association express its appreciation to Swanson and to the University of Illinois for the services which have been received. Seconded. Passed. The matter of the Proceedings issue was discussed. Possibilities of reducing the size by not publishing all papers or by printing abstracts were mentioned. Discussion was deferred.

13. The new contract which has been proposed by the George Banta Co., Inc., for printing the *AJAE*, which represents about a 10-percent price increase, was presented by Kearl. The Banta representative indicates that there will be a request for a further increase next year. Witt proposed that the Association authorize the acceptance of the contract for the balance of the year. Breimyer proposed that the contract should have a longer notification period. Ruttan proposed acceptance of the new contract to enable the publication of the *AJAE* for the balance of the year and suggested that the editor and others should look at the contract in terms of length of contract, etc., to provide the Association with more security and orderliness in the publication of the *AJAE*.
14. Bishop announced that Varden Fuller will serve as as Editor of the *AJAE* for an initial one-year period with agreement to continue for two additional years if the Board extends the appointment. The Associate Editor is Harold O. Carter and the Book Review Editor is Allen B. Paul.
15. Castle reported the activities of the Awards Committee. Witt moved that recommendations 4*b* and 4*c* of the report be adopted.

    These read:

    4*b* Departments are strongly encouraged to submit either ribbon copies, in the case of typewritten theses, or Xerox or other processed copies of comparable quality.
    4*c* The awards committee, with the approval of the President of the Association, reserves the right to make fewer than the announced number of awards when, in the judgment of the majority of the appropriate subcommittee, the quality of the entries does not warrant the making of the announced number of awards.

    Seconded. Passed.

    Nielson moved adoption of the recommendation 4*a* which reads:

    > Only one award, or a part of one award in the case of joint authors, will be given to an individual over 41 years of age at the time of publication. Otherwise, eligible recipients must be under 41 years of age at the time of publication, but may have older joint authors.

    There was no second.
16. Ackerman reported that John F. Booth, Maurice M. Kelso, and Elmer J. Working were elected as Fellows of the AAEA.
17. The question of payment of committee travel expense was discussed. Ruttan moved that travel expenses for committees not be approved as a regular matter but that special consideration be given for special meetings. Seconded. Passed.
18. Bishop presented the report of the Membership Committee for Lanham.
    Meeting recessed at 12:00 noon.
    Meeting reconvened at 2:00 P.M.

Present

Members: Bishop, Breimyer, Witt, Smith, Nielson, Ruttan, Kearl.
Guests: Swanson, Toussaint, Southern, Hathaway, Butz, Dunbar, Hillman, Castle, Redman, Ackerman, Abel, Martin, Day, Godwin, Eddleman.

19. Kearl presented the Sustaining Membership Committee report.
20. The Employment Committee activities were discussed. Ruttan moved that

the employment files not be made available after the meetings. Seconded. Breimyer moved that the motion be amended so that the files could be made available at the host institution for a year following the meetings and then be destroyed. The amendment was accepted and the motion as amended was passed.

21. Dunbar reported the activities of the Extension Affairs Committee. The proposals of the report were discussed. Ruttan moved that there be two Extension Awards but that the committee draw up criteria for the distinguished program awards including the preparation of materials as one of the criteria. Seconded. Passed. Action was deferred on the recommendation for the appointment of a standing committee.
22. Abel presented the report of the Retrieval of Agricultural Economics Literature Committee. The report included a proposal for the Association to establish and finance an American Agricultural Economics Documentation Center. Breimyer moved acceptance of the report. Seconded. Passed. The proposal is to be taken to the Association membership for their information.
23. Martin reported on the activities of the ad hoc committee on the Review of Postwar Work in Agricultural Economics. Nielson moved that the committee be authorized to continue its activities and be urged to have a meeting of the committee at Chicago in conjunction with the winter meetings. Seconded. Passed.
24. Godwin presented a proposal for joint membership of the Southern Agricultural Economics Association with the AAEA. Breimyer moved that the AAEA should enter into joint membership with the Southern Agricultural Economics Association under similar financial arrangements to those AAEA has with other Associations. Seconded. Passed.
25. Redman reported on arrangements for the 1969 meetings at Lexington, Kentucky. Nielson moved that medical and hospital insurance not be included in the annnual meetings local arrangements budget. Seconded. Passed.
26. Ackerman reported on the International meetings to be held in Russia August 23 to September 2, 1970. Eddleman presented information regarding the meetings in Florida. The best date for Florida, considering the university calendar, is August 23–26, 1970. The conflict of dates was considered and the matter of the 1970 meetings was tabled.

Meeting recessed at 5:40 P.M.
Meeting reconvened at 8:45 P.M.

Present

Members: Bishop, Breimyer, Witt, Smith, Kearl, Nielson, Ruttan.
Guests: Hathaway, Toussaint, Southern, Butz, Boggs, Ackerman, Hillman, Dunbar, Seaver, Tefertiller.

27. Bishop presented the AAEA–ASA Committee report. The committee proposes to have staggered terms on a three-year basis, with the committee appointing its own chairman. The proposal was approved.
28. Bishop presented the report of the Industry Committee. Several comments and suggestions were commended to the incoming president for his consideration.
29. Boggs reported the activities of the Student Affairs Committee. The committee suggests that an ad hoc committee be appointed by the Board to consider the conducting of a teaching symposium and report back at a later date.

30. The committee on the Exploration of Professional Problems in International Research requested through Bishop that reaction be given by the Board to proposals made in their previous report. In view of Wharton's membership on the AAEA Board and a feeling of a need for later consideration of the problem it was felt that no action should be taken at this time. Witt moved that the report be received and that the committee be recessed for the present. Seconded. Passed.
31. Bishop presented the report of the Graduate Student Evaluation and Recruitment Committee. Ruttan moved that the Association should cooperate with the AEA on the effort to evaluate the training of students at foreign institutions. Seconded. Passed. Witt moved acceptance of the report. Seconded. Passed.
32. Tefertiller reported that the Department of Agricultural Economics at Florida would like to host the meetings August 23–26 but could not do an acceptable job before or after those dates in 1970. Breimyer moved that Florida be thanked and requested to host the meetings in 1972. Seconded. Passed.
33. Tefertiller reported that the Contributed Papers Committee had received 100 papers and that four sections had been organized for the meetings.
34. Seaver presented a suggestion that the Association make arrangements for the preparation of a career brochure for Agricultural Economics. The matter was left for Breimyer's consideration.
35. Bishop reported that the CENAR Committee had been active and should report in December.
36. No action was taken on the proposal of dues reduction for members of long standing. The matter has previously been acted upon negatively.
37. Breimyer discussed the matter of the committee structure for the Association. He recommended that the standing committees be Awards, Audit, Editorial Council, Fellow Election, Investment, Membership and Sustaining Membership, Professional Activities, Relationship to other Professional Organizations, Student Affairs, and Tellers, and that there be special committees for Extension, Industry, Teaching, and Joint ASA–AAEA. Nielson moved that the committee recommendations be approved and that the Board express its appreciation to the Committee on the Reorganization of the Association. This committee was an ad hoc committee appointed by Witt and continued by Bishop. Seconded. Passed.
38. Ackerman reported on the activities of the AAEA–ASA committee in connection with the 1970 census.
39. Ruttan moved that the meeting be adjourned. Seconded. Passed.

Meeting adjourned at 10:40 P.M.

MINUTES OF THE MEETING OF THE EXECUTIVE BOARD

August 18, 1968, Bozeman, Montana

Meeting called to order by President-elect Breimyer at 10:40 P.M.

Present

Members: Breimyer, Bishop, Hathaway, Toussaint, Butz, Southern, Dunbar, Hillman (Wharton absent).

Ex officio: Kearl, Nielson.

Guests: Witt, Ackerman, Ruttan, Smith.

1. Breimyer named a nominating committee consisting of Harry Trelogan, Carrol Bottum, James Nielson, C. D. Kearl, and C. E. Bishop, Chairman.
2. Hathaway moved that a resolution be passed to authorize Kearl to conduct business involving investments for the Association with E. F. Hutton Co., New York, New York. Seconded. Passed.
3. Southern moved that a resolution be passed to enable Kearl to rent a safety deposit box at the Tompkins County Trust Co., Ithaca, New York. Seconded. Passed.
4. Dunbar moved that a resolution be passed to enable Kearl to conduct banking business for the Association with the Tompkins County Trust Co., Ithaca, New York. Seconded. Passed.
5. Because it appeared that the first job in implementing the proposal for a Documentation Center was to obtain financing to get it set up and operating, Hathaway moved that the President appoint a committee partially from the Retrieval of Agricultural Economics Literature Committee to explore the possibilities of support by foundations and other agencies for financing the AAEA Documentation Center for a five-year period. Seconded. Passed.
6. Dunbar moved that the appointments of Varden Fuller as Editor of the *AJAE* and C. D. Kearl as Secretary–Treasurer of AAEA be continued for another year. Seconded. Passed.

Meeting recessed at 11:00 P.M.
Meeting reconvened at 9:05 P.M. August 19, 1968.

Present

Members: Breimyer, Bishop, Butz, Hathaway, Dunbar, Toussaint, Southern, Hillman.
Ex officio: Kearl, Fuller.
Guests: Rhodes, Nielson.

7. Rhodes presented an invitation for the Association to hold its annual meeting on the campus of the University of Missouri in August 1970. Bishop moved acceptance of the invitation. Seconded. Passed. Southern moved that the meetings date be set during the week of August 9, 1970. Seconded. Passed.
8. Southern moved to accept co-sponsorship of the meetings in Texas in 1971 with WAEA. Seconded. Passed.
9. Breimyer reported on AAEA committee appointments for 1968-69.
10. It was noted that the name of the Western Agricultural Economic Association was changed to Western Agricultural Economics Association in mid-1967.
11. Breimyer reported that the program for the meetings at Chicago has been arranged and that W. E. Hamilton is the AAEA local arrangements chairman. The Executive Board meeting will be the afternoon of Friday, December 27, 1968.
12. Hillman moved that the dues of the AAEA be $10.00 per regular member and that no reduction be made for joint membership. Seconded. Passed.
13. The Bylaws were reviewed and editorial revisions entered. Bishop moved adoption as edited, subject to any changes in committees at the annual business meeting. Seconded. Passed.
14. Toussaint moved that in the event of an ineligible author or authors in the case of a published research award the amount of the award be reduced to the share that would normally have been received by the awardees if all authors were eligible. Seconded. Passed.
15. Southern discussed the matter of the Awards program score sheets and will

give the Board specific suggestions at its Chicago meeting.

16. Kearl presented the budget for 1969. Bishop moved adoption as revised per the discussion. Seconded. Passed.
17. Hillman moved that the arrangements with the University of California and Varden Fuller be formalized to be a grant of $7,000 to the University to help support the office and a budgetary item of about $600 to cover the editor's postage and supplies. Seconded. Passed.
18. Hathaway moved that the current level of bonding of the Secretary–Treasurer and his secretary be authorized. The curent bonds are $50,000 for the Secretary–Treasurer and $5,000 for his secretary. Seconded. Passed.
19. Breimyer noted that a proposal from the American Society of Agricultural Engineers for co-sponsoring meetings on machinery programming had been received but that a decision had been made not to join the endeavor. It was suggested that the President might contact the Board members by mail or telephone on such matters.
20. Hathaway moved that a proposal for joint meetings with the Rural Sociology Society be referred to the new committee on relations with other associations. Seconded. Passed.
21. Southern moved that the Secretary–Treasurer be authorized to advance up to $2,000 to the Local Arrangements Committee at Kentucky to help finance the 1969 annual meetings. Seconded. Passed.
22. Hillman moved that action on the question of a teaching symposium be delayed for a year. Seconded. Passed.
23. Hathaway moved that the President request a member of AAEA who is on the board of the National Academy of Science to serve for the Association in the matter of the preparation of a career brochure. Seconded. Passed.
24. Hathaway moved that the appropriate officers conclude the contract with the George Banta Co., Inc., for the printing of the *AJAE* through 1969 and that the Association obtain bids from other printers for comparison purposes in the event that the George Banta Co., Inc., requests a renegotiation of the contract dated November 1968. Seconded. Passed.
25. Bishop moved that the meeting be adjourned. Seconded. Passed. The meeting adjourned at 11:20 P.M.

MINUTES OF ANNUAL BUSINESS MEETING

August 20, 1968, Bozeman, Montana

Meeting was called to order by President Bishop at 11:10 A.M.

1. Bishop read a congratulatory telegram from the Secretary of Agriculture, Orville Freeman.
2. The minutes of the Annual Business Meeting of 1967 held at Guelph, Ontario, Canada, were approved as printed in the *AJAE*.
3. Bishop gave the President's report of the activities of the Association.
4. Kearl presented the report of the Secretary–Treasurer.
5. Kearl presented the report of the auditors.
6. Swanson reported the activities of the Editor of the *AJAE*.
7. It was moved and seconded that Swanson and the University of Illinois be thanked for providing the services of the Editor. Passed.
8. Breimyer moved approval of standing committees as follows: Awards Committee, Audit Committee, Editorial Council, Fellows Election Committee, Investment Committee, Membership and Sustaining Membership Com-

mittee, Professional Activities Committee, Committee on Relation to Other Professional Organizations, Student Affairs Committee, and Tellers Committee.

The motion was seconded. Passed.

9. Hathaway moved the adoption of a resolution thanking Montana State University and those involved for hosting the AAEA annual meetings. Seconded. Passed.
10. The presidency was transferred to Breimyer.
11. Breimyer announced that
    - *a*) Varden Fuller is to be the Editor of the *AJAE* as of January 1969 Harold Carter is to be the Associate Editor. Allen Paul is to be the Book Review Editor.
    - *b*) The Nominating Committee is C. E. Bishop, Chairman, Carroll Bottum, James Nielson, C. D. Kearl, and Harry Trelogan.
    - *c*) Nominations for Fellows should be sent to Kearl.
12. Kearl presented the budget for 1969.
13. The proposals of the Committee on Retrieval of Agricultural Economics Literature were discussed.
14. Briemyer reported that the Executive Board action included:
    - *a*) A decision to delay action on a proposal for a teaching symposium.
    - *b*) The decision that in the event of an ineligible co-author of a publication the amount of the award to be given to the eligible author(s) be reduced to the share that would normally have been received by the awardee if all authors were eligible.
    - *c*) Consideration of a proposal by the Rural Sociological Society for a joint meeting with the AAEA.
    - *d*) Asking a committee to give consideration to a brochure on career opportunities in Agricultural Economics.
    - *e*) A decision for the AAEA to join the new Southern Agricultural Economics Association in joint membership.
    - *f*) A decision that the dues for regular members of AAEA would be $10.00 with no reduction for joint membership.
    - *g*) A decision that the winter 1968 meetings would be in Chicago.
    - *h*) A decision that the summer meetings of the AAEA would be as follows: 1969, University of Kentucky; 1970, University of Missouri; 1971, Texas A&M University; 1972, University of Florida.

Meeting adjourned at 12:00 noon.

COMMITTEES OF THE AAEA, 1967-68

Executive Committee

C. E. Bishop	President
H. F. Breimyer	President-elect
V. W. Ruttan	1st Vice-President
James Nielsen	2nd Vice-President
C. Del Mar Kearl	Secretary–Treasurer
K. L. Bachman	Past President
L. W. Witt	Past President

Ex officio members
Stephen Smith, President, Western Agricultural Economics Association
Leslie E. Drayton, President, Canadian Agricultural Economics Society

AMERICAN JOURNAL OF AGRICULTURAL ECONOMICS

Earl R. Swanson	Editor
Lyle P. Fettig	Associate Editor
Leonard Schruben	Book Review Editor

Editorial Council

Richard Andrews
Harold O. Carter
A. N. Halter
Leonard Kyle
George Ladd
Sam Logan
Lee R. Martin
M. A. MacGregor
W. W. McPherson
Jerome Milliman
Allen Paul
Wesley B. Sundquist

Awards Committees

Emery N. Castle, General Chairman

Published research

Donald E. Farris, Chairman
Emerson Babb
Raymond A. Christensen
Clark Edwards
John Edwards
W. E. Folz
James Hassler
Leonard Haverkamp
Peter Helmberger
Aaron Nelson
G. Edward Schuh
Stephen Smith
James White

Doctoral theses

Gordon King, Chairman
Carleton Dennis
Carl K. Eicher
Ernest Grove
Howard Ottoson
Odell Walker
Willard Williams

Masters' theses

Wilbur Maki, Chairman
Robert Hutton
Paul Nelson
Neill Schaller
John Southern
Tom Stout
Eldon Weeks

Distinguished undergraduate teacher

Tyrus Timm, Chairman
L. A. Bradford
Trimble Hedges
Carroll Hess
Robert Kramer
F. R. Taylor
Stanley W. Warren

Extension

J. C. Williamson, Chairman
C. E. French
R. J. Hildreth
Wallace Ogg
Glen Pulver
Eric Thor

Membership Committee

William J. Lanham, Chairman
Stephen J. Brannen
C. Del Mar Kearl
Charles Pugh
Quentin West

Employment Committee

John C. Bower

Audit Committee

David Call, Chairman
J. S. Carpenter

Fellows Election Committee

George Brandow, Chairman
Joseph Ackerman
Willard Cochrane
Earl O. Heady
Harry Trelogan

Investment Committee

William J. Myers, Chairman
Leonard Haverkamp
A. C. Hoffman
C. Del Mar Kearl

Student Affairs Committee

Kenneth B. Boggs, Chairman
James Nielsen, Advisor
James H. Cothern
Gail L. Cramer
Sidney Ishee
Harold Love
R. J. Peeler, Jr.
Wallace Rehberg
Robert Taylor
James W. Van Winkle

Sustaining Membership Committee

C. Del Mar Kearl, Chairman
Martin Abrahamson
S. Kent Christensen
Norman Coats
Carleton Dennis
Bradley Donahoe
Arval L. Erickson
Robert Haldeman
James T. Hall
Dean E. McKee
Charles R. Sayre, Jr.
Lauren K. Soth
R. S. Toussaint
William C. Welden

Nominating Committee

C. E. Bishop
L. W. Witt
K. L. Bachman

Committee on Retrieval of Agricultural Economics Literature

Fred Abel, Chairman
Norman R. Collins
L. M. Day
Lloyd C. Halvorson
I. T. Littleton
James Nielson
I. W. Schmedemann
Wolfgang Schultz
John T. Scott
William Stuckey
George E. Toben
Arthur True

Extension Activities Committee

John Dunbar, Chairman
Lee Roy Kolmer
Leonard Kyle
Glen C. Pulver
Doyle Spurlock
L. T. Wallace
J. C. Williamson

Industry Committee

Ronald Aines, Chairman
Dale E. Butz
William Ewasiuk
Leonard Haverkamp
Dean E. McKee
Roby Sloan

Contributed Papers Committee

Kenneth Tefertiller, Chairman
Travis Manning
Milton Manual
Niels Rorholm
John Schmidt
William D. Toussaint
Andrew Vanvig

Joint ASA–AAEA Advisory Committee on Agricultural Statistics

Joseph Ackerman, Chairman
Robert Eggert
A. L. Finkner
Wayne Fuller
H. O. Hartley
Raymond Jensen
Marc Nerlove

Committee to Explore Professional Problems in International Research

Clifton Wharton, Chairman
Robert L. Clodius
Carl K. Eicher
Walter P. Falcon
Bruce F. Johnson
Richard A. King
John Mellor
V. W. Ruttan
D. Woods Thomas

Committee on Graduate Student Evaluation and Recruitment

Robert Rudd, Chairman
Leo Blakely
Harold Carter
Dale Hathaway
W. G. Tomek

Committee to Review Postwar Work in Agricultural Economics

Lee R. Martin, Chairman
Glen L. Johnson
M. M. Kelso
James Martin
M. L. Upchurch

Program Committee, Summer Meetings, 1968, Bozeman, Montana

C. E. Bishop, Chairman
Stephen C. Smith, Co-Chairman
With the assistance of 18 sectional meeting chairmen

Tellers Committee

Robert Sinclair, Chairman
Verle Houghaboom
Raymond Tremblay

Local Arrangements Committee

R. J. McConnen, Chairman
John Bower
Clarence Jensen
Dana Myrick
Layton Thompson
Edward Ward

Representatives to the National Research Council

George Brandow
W. B. Sundquist

AAEA Consultant to the Bureau of the Census

Joseph Ackerman

Program Committee, Winter Meetings, 1967, Washington, D.C.

Albert Ando, Chairman
C. E. Bishop
K. M. Boulding
James Nielsen
V. W. Ruttan
E. Clinton Stokes
T. D. Wallace

Local Arrangements, Winter Meetings, 1967, Washington, D.C.

E. Clinton Stokes

Local Arrangements, Summer Meetings, 1969, Lexington, Kentucky

John C. Redman, Chairman
Loys Mather, Employment
Russell Brannon, Publicity

Executive of the Western Agricultural Economics Association

Stephen C. Smith

BYLAWS

of

American Agricultural Economics Association

Article I

Offices

The business office of the Association shall be the business address of the secretary–treasurer of the Association. The registered office of the Association shall be the Department of Economics, Iowa State University, Ames, Iowa and the registered agent at such address shall be Neil E. Harl.

Article II

Membership

Section 1. *Application for membership.* Any person, firm, corporation, association, group, or partnership eligible for membership in one or more classes of members as hereinafter provided may file with the secretary–treasurer of the Association an application for membership in said class or classes of membership. Upon payment of dues as prescribed for the particular membership class, and upon acceptance of the application for membership, the applicant shall be considered a member in good standing of the Association.

Section 2. *Classes of members.* The membership of the Association shall be comprised of four classes.

a) Regular members shall be entitled to all benefits of Association membership and shall have one vote each at any meeting of the Association.

b) Junior members shall be entitled to all benefits of Association membership and shall have one vote each at any meeting of the Association. Junior membership shall be open to individuals who are actively pursuing study at a college or university and shall be limited to a maximum of three years for each such member. Applications for junior membership must be countersigned by the head of the major department in which the applicant is enrolled as a student, which countersignature shall attest to current student status.

c) Corresponding members shall have voting rights and shall be entitled to all benefits of Association membership. Foreign agricultural economists who have visited the United States are eligible to become corresponding members upon recommendation of the Agency for International Development.

d) Each sustaining member shall have voting rights, with one vote accorded each such sustaining member, and shall be entitled to such other benefits of Association membership as shall be determined by resolution of the executive board. Any person, firm, corporation, association, group, or partnership may become a sustaining member upon payment of such sum as may be fixed from time to time by resolution of the executive board. Voting rights of sustaining members who are other than individuals may be exercised by the president of such firm, corporation, association, group, or partnership, or by his designated representative.

Article III

Association Dues

Section 1. *Scale of dues.* Each member shall pay Association dues for each year from January 1 to December 31 following, payable on January 1 of each year in advance. The amounts of dues shall be as follows for each class of membership:

a) Regular membership—$10.00
b) Junior membership—$5.00
c) Corresponding membership—$13.00
d) Sustaining membership—$100.00

The above amounts of dues shall include the individual subscription of the member to the official journal of the Association.

Section 2. *Default in payment.* Membership for any calendar year shall become delinquent as of April 1 of that year if dues are not paid prior to that date.

Article IV

Selection of Fellows

Section 1. *Title.* The title of the award shall be "Fellow of the American Agricultural Economics Association."

Section 2. *Criteria for selecting Fellows.* The main consideration shall be continuous contribution to the advancement of agricultural economics. Achievements may be in the fields of research, teaching, extension, administration, or business.

Section 3. *Nomination.* Any member of the Association may nominate any living person for the honor of election as a Fellow by submitting his name to the secretary–treasurer of the Association prior to December 15 preceding the election. Any member making nominations should be prepared upon request to submit biographical information in support of the nominee.

Section 4. *Candidates.* The executive board of the Association shall select candidates from the nominees (approximately twice the maximum number to be elected) and present the list of candidates to the fellows election committee of the Association together with supporting biographical data for each.

Section 5. *Election.* The fellows election committee shall select the Fellows, not to exceed three in any one year, from the nominees submitted by the executive board of the Association.

Section 6. *Reporting election.* The chairman of the fellows election committee shall report to the president and the secretary–treasurer of the Association at least 60 days before the annual meeting the names of the newly elected Fellows.

Section 7. *Announcement of election.* The names of the newly elected Fellows shall be announced at the annual meeting of the Association by the president of the Association or his appointed representative, who shall read a statement regarding the achievements of each Fellow and shall present a certificate of recognition to the person so honored. The statement regarding achievements shall be published in the proceedings issue of the official journal of the Association.

Section 8. *Fellows election committee.* The fellows election committee shall be a rotating committee with a revolving chairmanship and shall be composed of five Fellows selected as follows:

a) Each year the president of the Association shall appoint a member from among the Fellows for a five-year term to replace the member whose term expires.

b) The president shall also appoint members to fill unexpired terms if vacancies occur during his incumbency and in so doing he shall designate the unexpired portion of the term for which the appointment is made.

c) Each year the president shall appoint, from among senior members of the committee in length of time served, the chairman of the committee.

d) The president may appoint a secretary for the fellows election committee who need not be a Fellow of the Association or a member of the fellows election committee.

Article V

Awards Program

To recognize and encourage meritorious contributions to the agricultural economics profession, the Association shall sponsor awards in the following categories. No research shall be eligible for more than one award regardless of the type of award or method of publication.

Section 1. *Best article in journal.* This award shall be made by the editorial council and staff of the official journal of the Association. One award may be made each year. An author is limited to one award during each three-year period.

Section 2. *Published research.* Recipients for this award shall be selected by the awards committee. Three awards may be made each year. An author is limited to one award during each three-year period and must be under 41 years of age on the date of publication. Entries may be submitted by individuals or organizations. Members of the awards committee are not eligible for the award.

Section 3. *Doctoral dissertation.* The selection of recipients for this award shall be made by the awards committee. Three awards may be made each year. Entries must be submitted by the head or chairman of the department to which the dissertation was presented and by which it was approved. Each department may submit one dissertation for each eight recipients of the doctoral degree or fraction thereof during the preceding calendar year.

Section 4. *Master's thesis.* Recipients for this award shall be selected by the awards committee. Three awards may be made each year. Entries must be submitted by the head or chairman of the department to which the thesis was presented and by which it was approved. Each department may submit one thesis for each digit (or fraction therof) individuals receiving the master's degree during the preceding calendar year.

Section 5. *Distinguished undergraduate teacher.* The selection of recipients for this award shall be made by the awards committee. Each committee member must have had at least five years of undergraduate teaching experience. One award may be made each year. The award is limited to individuals who have been actively engaged in undergraduate teaching for not less than five years and must have been actively engaged in undergraduate teaching in the year for which the nomination was made. Nominations may be submitted by an individual other than the nominee, by a group of individuals who are colleagues of the nominee, or by a department.

Section 6. *Outstanding extension program.* Recipients for this award shall be selected by the awards committee. Nominations for the award may be made by any member of the Association. To be eligible for the award, nominees must have shared in primary responsibility for the activity or program which supports the nomination. Two awards may be made each year.

Section 7. *Undergraduate debate.* Recipients for this award shall be selected by a panel of judges appointed by the appropriate committee. All undergraduate students are eligible to enter competition for this award. Students entering debate competition are also eligible to enter competition for the undergraduate essay award but are not eligible to enter competition for the undergraduate public speaking award.

Section 8. *Undergraduate public speaking.* Recipients for this award shall be selected by a panel of judges appointed by the appropriate committee. All students are eligible to enter competition for this award. Students entering public speaking competition are also eligible to enter competition for the undergraduate essay award but are not eligible to enter competition for the undergraduate debate award.

Section 9. *Undergraduate essay.* Recipients for this award shall be selected by a subcommittee of the appropriate committee. All undergraduate students are eligible to enter competition for this award. Students entering undergraduate essay competition are also eligible to enter competition for either the undergraduate debate award or the undergraduate public speaking award. Essays entered in competition for the undergraduate essay award must deal with agricultural economics, agricultural industries, or rural sociology. The head or chairman of the department of each entrant must certify the essay as the original work of the student entrant. Entries are limited to a maximum of five for each college or university.

Article VI

Duties of Officers

Section 1. *President.* The president shall be the chief executive officer of the Association and, subject to the control of the executive board, shall in general supervise and conduct the business and affairs of the Association. He shall, when present, preside at all meetings of the Association and of the executive board. He shall have authority to sign, execute, and acknowledge, on behalf of the Association, those instruments provided in Article VIII hereof and instruments necessary or proper to be executed in the course of the Association's regular business or which shall be authorized by resolution of the executive board. The president shall make appointments to special and standing committees and subcommittees created by action of the executive board or general membership. He shall be responsible for preparing a program for the annual meeting. In general, the president shall perform all duities incident to the office of president and such other duties as may be prescribed by the executive board from time to time.

Section 2. *President-elect.* In the event of temporary disability of the president to perform his duties or his absence from any meeting of the general membership or of the executive board, the president-elect shall perform the duties of the president during the continuance of such temporary disability or absence as acting president, and when so acting shall have all the powers of and be subject to all the restrictions upon the president. The president-elect shall perform such other duties and have such authority as from time to time may be assigned to him by the president or the executive board.

In the event of death, incapacity or inability to serve of the president-elect, as provided in Article VI, Section 1 of the Constitution, the executive board shall determine, giving due consideration to exigencies of time, whether the selection of a president shall be by vote of members of the Association having voting power by mail ballot or by vote of the members of the Association at the annual meeting.

Section 3. *Secretary–Treasurer.* The Secretary–Treasurer shall (*a*) keep the minutes of meetings of the general membership of the Association and of the executive board in one or more books provided for that purpose; (*b*) see that all notices are duly given in accordance with the provisions of these Bylaws, the Constitution, Articles of Incorporation, or as required by law; (*c*) be custodian of the Association's records; (*d*) maintain the register of the post office address of members of each class; (*e*) certify resolutions; (*f*) have charge and custody and be responsible for all funds and securities of the Association, receive and give receipts for moneys due and payable to the Association from any source whatsoever, endorse and deposit all such moneys in the name of the Association in such banks, trust companies or other depositories as shall be designated by resolution of the executive board; (*g*) function as principal accounting officer in charge of books of account, accounting records, and forms of the Association; (*h*) maintain adequate records of all assets, liabilities, and transactions of the Association; (*i*) obtain from other officers all reports needed for recording the general operation of the Association or for supervising and directing accounts; and (*j*) in general perform all of the duties incident to the office of secretary–treasurer and have such other duties and exercise such other authority as from time to time may be delegated or assigned to him by the president or the executive board. The secretary–treasurer shall be covered by a fidelity bond in an amount determined by resolution of the executive board.

Article VII

Elections

Section 1. *Ballots.* Not later than April 1 of each year, the secretary–treasurer shall mail a ballot to each member of the Association having voting rights. Said ballot shall provide for an opportunity to vote for each nominee for each elective office to be filled. The nominees for each director position shall be listed and voted upon independently from other positions on the executive board. For each elective office, the ballot shall contain one blank line for write-in candidates. A brief biographical sketch of each nominee selected by the nominating committee shall be included. The ballot shall be enclosed in an envelope which shall be marked on the outside thereof as follows:

"Ballot for Officers and Directors of the American Agricultural Economics Association. This ballot must reach the secretary–treasurer not later than June 1 to be counted. Name ______________________

Your name is required for checking with the list of members whose dues have been paid as of April 1, which constitutes eligibility to vote.

"Ballots will be opened by the tellers in such a manner as to preserve the secrecy of the ballots."

Section 2. *Tellers.* The sealed ballots shall be opened by tellers appointed by the president. The results shall be reported to the executive board not later than June 15, and appropriately thereafter to the membership. The persons receiving a plurality of votes shall be declared elected. A tie for any office shall be resolved by chance, conducted under the supervision of the tellers and reported to the executive board.

Article VIII

Commercial Transactions

Section 1. *Endorsement of stock certificates.* Any share or shares of stock issued by any corporation and owned by this Association may, for sale or transfer, be endorsed in the name of the Association by the president or the secretary–treasurer, subject to specific directions as to such sale or transfer by the executive board.

Section 2. *Voting of shares.* Any share or shares of stock issued by any corporation and owned by this Association may be voted at any shareholders' meeting of such corporation in person or by proxy by the president or the secretary–treasurer.

Section 3. *Deposits.* All funds of the Association not otherwise employed shall be deposited from time to time to the credit of the Association in such banks, trust companies, or other depositories as may be determined by resolution of the executive board.

Section 4. *Execution of deeds, mortgages, and releases.* All deeds, conveyances, leases, and mortgages of real property made by the Association shall be executed by the president, and all releases of mortgages, liens, judgments, and other claims that are required by law to be made a matter of record may be executed by the president or secretary–treasurer of the Association.

Section 5. *Negotiable instruments.* All checks, drafts, notes, bonds, bills of exchange, and orders for the payment of money of the Association must be signed by either the president or the secretary–treasurer.

Section 6. *Borrowing money.* The secretary–treasurer may borrow money up to a maximum total amount of ten thousand dollars without further executive board authorization and may pledge as security therefore stocks and securities of the Association as required.

Section 7. *Purchase and sale contracts.* The president shall have the authority to enter into written or oral contracts for the purchase and sale of goods and services on behalf of the Association. The secretary–treasurer may enter into written or oral contracts for the purchase of supplies, postage, printing services, and other goods and services reasonably related to operation of the office of secretary–treasurer.

Article IX

Fiscal Year

The fiscal year of the Association shall begin on the first day of January and end on the thirty-first day of December in each year.

Article X

Procedures for Meetings

Section 1. *Resolutions.* All resolutions pertaining to policy matters presented from the floor at meetings of the Association for approval must be submitted at least one full day in advance to the executive board. The executive board shall

report all such proposed resolutions and resolutions initiated by the executive board and the president to the general membership for action with appropriate recommendation for or against passage.
Section 2. *Appropriations.* All motions presented from the floor at meetings of the Association entailing, directly or indirectly, appropriation of moneys of the Association, must be submitted at least two full days in advance to the executive board. The executive board shall report all such proposed notions to the general membership for action with appropriate recommendations for or against passage.
Section 3. *Parliamentary authority.* The rules contained in *Roberts' Rules of Order Revised* shall govern meetings of this Association in all cases in which they are applicable and in which they are not inconsistent with these Bylaws, the Constitution, the Articles of Incorporation, or applicable law.

Article XI

Appropriations and Expenses

Section 1. *Annual budget.* The executive board shall approve the annual budget for the Association, which approval shall constitute authorization for expenditure.

Article XII

Committees

Section 1. *Standing Committees.* There shall be standing committees on

Audit
Awards
Membership and Sustaining Membership
Fellows Election
Investment
Relations with Other Professional Organizations
Editorial Council
Professional Activities
Tellers
Student Affairs

Each standing committee may recommend to the executive board the creation of specific subcommittees.
Section 2. *Special committees.* There shall be such special committees as the executive board shall from time to time create by resolution.
Section 3. *Ad hoc committees.* The president may from time to time create ad hoc committees whose existence shall terminate with the expiration of the president's term of office.

Article XIII

Amendments

These Bylaws may be amended by a majority vote of the members of the executive board present at a meeting at which a quorum is present and at which the same is voted on.

Know all men by these presents: That we, the undersigned, being all of the members of the executive board, hereby assent to the foregoing Bylaws and adopt them as the Bylaws of the Association.

In witness whereof, we have hereunto subscribed our names this the 19th day of August, 1968.

HAROLD F. BREIMYER

DALE E. HATHAWAY

CHARLES E. BISHOP

JOHN H. SOUTHERN

WILLIAM D. TOUSSAINT

DALE E. BUTZ

JIMMYE S. HILLMAN

JOHN O. DUNBAR

CLIFTON R. WHARTON, JR.

REPORTS OF THE WESTERN AGRICULTURAL ECONOMICS ASSOCIATION

PART I

COMMITTEES OF THE WESTERN AGRICULTURAL ECONOMICS ASSOCIATION, 1967-68

Executive Committee

President	Stephen C. Smith
President-elect	James Nielson
Editor-and-(Past)-Vice-President	Jean B. Wyckoff
Vice-President-and-Editor (elect)	James R. Gray
Past President	Jimmye S. Hillman
Secretary–Treasurer	Leo R. Gray

WAEA Council

Alaska—C. F. Marsh
Arizona—R. W. Fox
California—A. F. McCalla
Colorado—D. D. Rohdy
Hawaii—J. T. Ishida
Idaho—R. V. Withers
Montana—D. H. Myrick
Nevada—E. R. Barmettler
New Mexico—G. M. Burke
Oregon—R. C. Youmans
Utah—R. A. Christensen
Washington—E. L. Michalson
Wyoming—J. S. St. Clair

Trustees

Ray G. Bressler, Jr. (deceased)
Mark T. Buchanan
Leo R. Gray

WAEA Awards Committee

B. Delworth Gardner—General Chairman

Published Research—
Paul W. Barkley, Chairman
Ben C. French
James R. Gray

Extension Program—
S. Kenneth Oakleaf, Chairman
L. Tim Wallace
Jack T. Ishida

Graduate Thesis—
Joe B. Stevens, Chairman
Roger W. Fox
Maurice C. Taylor

WAEA Ad Hoc Industry Liaison Committee

Karl Brandt, Chairman
Don D. Rohdy
G. Burton Wood
William E. Folz
Jimmye S. Hillman
Leo R. Gray, ex officio

WAEA Ad Hoc Committee to Study the Structure and Duties of WAEA Officers

Martin V. Waananen, Chairman
Robert S. Firch
John O. Gerald
Leo R. Gray
James S. St. Clair

WAEA History Committee

D. Barton DeLoach, Chairman
Murray R. Benedict
Karl Brandt
Marion Clawson
Henry Erdman
Cruz Venstrom
Leo R. Gray, ex officio

WAEA Committee on Extension Participation

Manning H. Becker, Chairman
George W. Campbell, Jr.
Kenneth R. Farrell
S. Kenneth Oakleaf
N. K. Roberts
Martin V. Waananen
R. James Hildreth, Consultant

Tellers Committee

Russell V. Withers, Chairman
Leo R. Gray

Resolutions Committee

Alden C. Manchester, Chairman
Herbert H. Stoevener
Eldon E. Weeks

Sustaining Members of WAEA

Safeway Stores, Inc., Oakland, California
James Mills Orchard Co., Hamilton City, California

PART II

Minutes of the Meeting of the WAEA Council
August 18–19, 1968, Bozeman, Montana

1. The Council met in two sessions, late Sunday afternoon and Monday afternoon. President Smith indicated that the Proceedings of this meeting would be published jointly with AAEA.
2. Secretary–Treasurer's Report was presented by L. Gray for

   a) Membership and financial status as of 5/31/68.

   WAEA Council passed a motion to recommend that WAEA have one class of membership whereby all members have existing rights and privileges, but that the classification of the rate structure be stratified at the existing rates for Individual Members, Individual Contributing Members, Sustaining Members, Lifetime Members, and Student Members (for a maximum of three years for graduate and senior undergraduate students).

   b) Meter-mail privileges.

   Efforts were made to obtain meter-mail privileges as a nonprofit organization, but were in vain. An attempt will be made to seek another classification for exemption as a nonprofit organization from IRS, and if successful another attempt will be made to obtain meter-mail privileges as a nonprofit organization. If successful, mailings can be made at a substantially reduced rate.

   c) List of agricultural economics graduates.

   This list has been compiled and is in the process of being distributed to cooperating institutions and to our Sustaining Members.
3. Comments of WAEA Trustee, M. T. Buchanan.

   A motion passed that WAEA favorably consider the idea that in principle funds obtained from Sustaining Members might possibly be set aside, and depending on the amount available, used as a special fund for one or more such purposes as (*a*) one or more student fellowships; (*b*) payment to help defray expenses to attend the annual WAEA meetings of members assessed at the special student date; and (*c*) payment to help defray expenses to attend the meetings of the International Association of Agricultural Economists of perhaps some member of the Association assessed at the individual member rate.

   A motion passed that the President of WAEA appoint an Ad Hoc Committee to study the practicability and justification of WAEA carrying out programs such as suggested in the preceding motion, and to recommend to the Association's Council how funds for such programs should be raised.
4. WAEA Ad Hoc Industry Liaison Committee:

   L. Gray reported for this committee that, to date, WAEA has one Sustaining Member (Safeway Stores, Inc., Oakland, California). Karl Brandt received names of prospective Sustaining Members from other committee members. Letters have been written to a number of the prospects requesting that they become Sustaining Members of WAEA. Brandt recommended that J. S. Hillman be appointed to replace him as chairman of this committee.

   The WAEA Council passed a motion to recommend that the report of the Ad Hoc Industry Liaison Committee be accepted as given.

   (Note: Following the meetings, the James Mills Orchard Co., of Hamilton City, California, also became a Sustaining Member of WAEA for the year 1968.)

SECRETARY-TREASURER'S REPORT, WAEA

June 1, 1967–May 1, 1968

FINANCES:

Cash on hand, June 1, 1967		$6,275.05
Receipts:		
Membership dues	$2,598.42	
Interest on Savings	154.26	
Proceedings Sales	161.37	
Share of returns from 1967 annual meeting	170.63	
		$3,084.68
		$9,359.73
Expenditures:		
1966 Proceedings cost	$1,467.10	
Postage, Supplies	247.48	
1967 Awards	250.00	
		$1,964.58
		$7,395.15

MEMBERSHIP: 1966—618 1967—718 5/31/68—727*

States	Sustaining Members	Junior Members	Regular Members		Grand Total
			WAEA Only	Joint	
13 Western States:					
Alaska				4	4
Arizona		5	2	27	34
California	1	16	11	110	138
Colorado			1	25	26
Hawaii		3		9	12
Idaho		2	1	8	11
Montana		6	2	27	35
Nevada			1	6	7
New Mexico		3	1	22	26
Oregon		7	8	23	38
Utah		3	5	19	27
Washington		3	1	32	36
Wyoming		2	1	9	12
Total	1	50	34	321	406
6 Plains States					
Kansas		1		13	14
Nebraska		1	1	13	15
North Dakota				11	11
Oklahoma				14	14
South Dakota				11	11
Texas		1		25	26
Total		3	1	87	91
D. C., Maryland & Virginia			4	71	75
29 Other States		4		111	115
Canada			2	14	16
Other Countries		1		23	24
Total		5	6	219	230
Grand Total	1	58	41	627	727

* Annual membership is on a calendar year basis. Many additional memberships are received after May 31, the end of each fiscal year.

5. WAEA Ad Hoc Committee to Study the Structure and Duties of WAEA Officers: Waananen distributed a prepared report to the WAEA Council that included some background information that led to formation of this committee, and recommendations regarding publication of Proceedings and revisions in the Constitution.

   There was considerable discussion of this report that included comments on some alternatives as to (*a*) the desirable length of both major and minor papers with the objective of shortening the length of the Proceedings, and shortening the time lag between the annual meetings and the availability of the Proceedings; (*b*) the desirability of continuing to have a Proceedings issue of papers presented at the annual meetings; (*c*) the possibility of having a staff person placed in the Secretary–Treasurer's office to help with the editing and publishing of the Proceedings; and (*d*) the desirability of changing the name from *Proceedings* to the *Western Agricultural Economics Journal.*

   A motion passed recommending that Waananen's proposed report, together with alternatives suggested at this WAEA Council meeting (see above), plus a memorandum from the Association's new President (James Nielson) be distributed to active members of the Association by mail, and that members should return their comments and suggestions related to the above materials to the Secretary–Treasurer. In addition, the Council also recommends that an Ad Hoc Committee be appointed by the Association's new President to review the comments and suggestions received and make recommendations to the Secretary for further consideration by the WAEA Council.
6. WAEA History Committee Report:

   DeLoach presented a report of the Committee's activities to date. He noted that the basis for developing a history of the Association is essentially the Proceedings issues that have been published, plus whatever information can be obtained from Past Presidents and other members who are knowledgeable about the Association's history and development.

   The committee has met and agreed on a topic outline that was finalized by DeLoach. DeLoach has made a tabulation of papers presented in prior Proceedings. A basic problem now is that the committee ought to be augmented.

   DeLoach suggested that the next procedure ought to be to develop a detailed letter or questionnaire, that could be sent to former Presidents of the Association and others who are knowledgeable about the Association's history. Such a questionnaire should be designed to solicit information as to what philosophy was used and what compromises occurred during the period of their program formulation and term in office. We need to find out whether essential facts are available or can be analyzed.

   A motion passed to recommend that the WAEA History Committee continue under the chairmanship of D. B. DeLoach, that they work toward the publication of their work, that secretarial and travel money be made available to committee as needed and as available as determined by the officers of the Association, and that the committee be augmented by the President with nominations made by the committee chairman. The Council further commended Professor DeLoach for his excellent work.
7. Committee on Extension Participation in WAEA:

   President Smith reported on the formation of this new committee which has not yet met.

   Smith also suggested consideration might be given to the appointment of a committee on industry and consulting economists in WAEA.

8. Future meetings of WAEA:
   1969: A motion passed that the next annual meeting of WAEA be held in Oregon, July 20–23, 1969. (It was noted that a month-long session of a Natural Resources Economics Institute will be held in Corvallis, Oregon, just prior to the forthcoming WAEA meetings.)
   1970: The 1970 WAEA meetings will be in Arizona, but actual dates have not been set.
   1971: A motion passed that WAEA hold joint meetings with AAEA in Texas in 1971.
   1972: The Utah Council Representative, Christensen, extended a bid inviting the Association to hold the WAEA annual meeting at Utah in 1972.
9. A motion passed to have the Association's name changed from Western Agricultural Economic Association to Western Agricultural Economics Association.
   The WAEA Council meeting was held over to the following afternoon, and was finally adjourned at 6:05 P.M. on August 19, 1968.

PART III

WAEA Annual Business Meeting

August 20, 1968, Bozeman, Montana

President Smith convened the Annual Business Meeting at 8:10 A.M.

1. A motion passed that the Minutes of the 1967 Annual Meetings be approved as published.
2. A motion passed that the Secretary–Treasurer's Report, for the period June 1, 1967, to May 31, 1968, he accepted.
3. Minutes of the 1968 WAEA Council meeting were read by the Secretary. A motion passed that these Minutes be accepted as reported.
4. Tellers Committee: R. V. Withers reported the following results of the election of WAEA Officers for 1968-69: President-elect, J. S. St. Clair; and Vice-President-and-Editor (elect), C. E. Stewart.
5. Presentation of Awards:
   B. D. Gardner as General Chairman of the WAEA Awards Program presented the report of the Awards Committees and made presentations of checks (and promises of certificates to follow) to the winners or their proxies, and announced those who received honorable mention.

The Award Winners, and those who received honorable mention were

RESEARCH—Winner

GERALD DEAN AND NORMAN R. COLLINS, "World Trade in Fresh Oranges: An Analysis of the Effect of European Economic Community Tariff Policies. Giannini Foundation Monograph No. 18.

—Honorable Mention

IVAN LEE, "Conditional Projections of California Economic Growth." Giannini Foundation Monograph No. 19.
DURAND BELL, JR., "Methods of Community Transfer." Giannini Foundation Report No. 20.

EXTENSION—Winner

GEORGE W. CAMPBELL, JR., University of Arizona—"Valuation of Privately-Owned Agricultural Lands—To Assume Equitable Treatment for all Farmers and Ranch Property."

—Honorable Mention

WALTER B. ROGERS, University of Alberta, Canada—"Leadership Study Program in Rural Sociology and Economics."

GRADUATE THESIS—**Winner**

DANIEL W. BROMLEY, Oregon State University—"An Inter-Industry Analysis of the Importance of Grazing on Federal Lands to the Economy of Grant County, Oregon."
Major Professor: Dr. Grant E. Blanch

—Honorable Mention

VICTOR ARNOLD, Colorado State University—"Allocation of a Shrimp Fishing Fleet Under Minimum Aggregate Production Cost Conditions: Dry Tortugas, Gulf of Mexico: 1965."
Major Professor: Dr. Paul W. Barkley.

6. Past President Hillman installed the new officers. The new slate of officers is Dr. James Nielson, President; Dr. J. S. St. Clair, President-elect; Dr. S. C. Smith, Past President; Dr. C. E. Stewart, Vice-President-and-Editor (elect); Dr. James R. Gray, Editor-and-(Past) Vice-President; Dr. M. T. Buchanan, Trustee; and Mr. L. R. Gray, Secretary–Treasurer.
   The outgoing slate of officers were congratulated for their role in planning the 1968 Annual Conference.
7. Nielson assumed the podium as President.
   Nielson—A new Southeast Agricultural Economics Association has been formed. Whereas we have been meeting jointly with AAEA about every three years, in the future, such joint meetings will likely be about every four or five years.
   —Dr. R. C. Youmans will be the Chairman of the Local Arrangements Committee for the 1969 Annual WAEA meetings at Oregon.
8. President Nielson called for the report of the Resolutions Committee. Chairman Manchester read the following report:

Resolution No. 1

The Western Agricultural Economics Association has lost two of its Past Presidents since last we met. Our friends Ray Bressler and Wendell Calhoun are no longer with us. Our world is not the same. We miss their leadership, their laughter, and Cal's shirts. Both gave themselves unstintingly to the advancement of the profession of agricultural economics. The profession is immeasurably better for their contributions.

Resolution No. 2

The Association acknowledges gratefully the contributions of many who during the past year carried out the work of the Association. Especially, we are indebted to Stephen C. Smith, President; James R. Gray, Vice-President-and-Editor (elect); Jean B. Wyckoff, Editor-and-(Past) Vice President; Leo R. Gray, Secretary–Treasurer; Jimmye S. Hillman, Past President; James Nielson, President-elect; and the members of the various committees.

Resolution No. 3

The Western Agricultural Economics Association wishes to express its sincere appreciation to Montana State University and the City of Bozeman for providing us with excellent housing, meals, meeting rooms, and for their fine hospitality, including their exercise of influence over weather determinants. We wish especially to thank the members of the Department of Agricultural Economics for their care in developing detailed arrangements and their hospitality toward the members of the Association and their families.

A motion passed unanimously that the above three resolutions be approved. President Nielson adjourned the meeting at 8:50 A.M.

Subsequent to the Annual Business Meeting, the Executive Committee of WAEA was surveyed, and the Committee unanimously agreed to continue the individual membership dues at $3.50 for calendar year 1969, and to discontinue the 50 cents reduction allowance that has been available for joint membership arrangements with the American Agricultural Economics Association and/or the Canadian Agricultural Economics Society. Dues for such joint memberships, however, can still be made payable to one organization.

Respectfully submitted,
LEO R. GRAY
Secretary–Treasurer

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